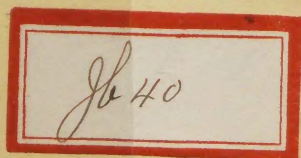
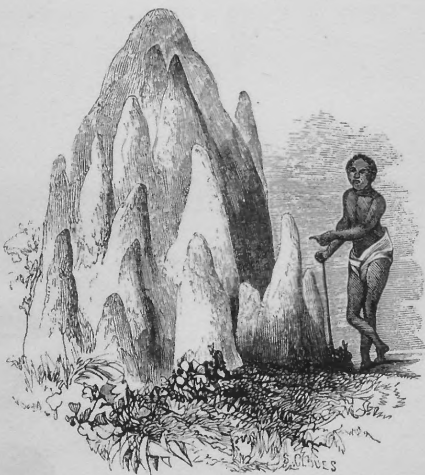


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Nests of White Ant.

LESSONS FROM INSECT LIFE.

WITH NUMEROUS ILLUSTRATIONS.

"Things which are little upon the earth, but they are exceeding wise." — PROV. xxx. 24.



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“THE works of the Lord are wonderful, sought out of all them that have pleasure therein.” The writer of this little volume believes that the study of Insect Life as here portrayed will lead the reader to admire that goodness of God which is manifest in all the works of creation, to recognize him in all things, to feel that he has made nothing in vain, and to realize more than ever before that blessings often exist in the seeming ills of life. The subjects are treated as fully as the space will allow; and it is hoped that on every page the reader will recognize the hand of Him who “hath made every thing beautiful in his time.”

DE B.

CHESTNUT HILL, Feb. 1863.

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THE ANT.

“Go to the Ant, thou sluggard ; consider her ways and be wise.”



THE ANT.



CHAPTER I.

The Ant a pattern of industry. — Different species of Ants. — The worker and its labors. — Deserters. — The Queen and her subjects. — Social character of Ants. — Recognition among Ants. — Eggs and young Ants. — Nurse Ants. — Maternal affection. — Eyes of Ants. — Sense of Smell. — Strength. — Ingenuity. — Idlers. — Perseverance. — Language.

DID you ever, after a gentle summer rain, notice the ant-hills which had sprung up, as if by magic, in the sandy road or along the foot-path? And did you ever stop to think of the industry of the little insects which made them? Sometimes, perhaps, your careless footstep has fallen upon them, and did you then observe how speedily the ants came forth to repair the mischief which had been done?

This insect has been held up as a pattern of

industry ever since King Solomon said, "Go to the ant, thou sluggard ; consider her ways and be wise ;" — and it will be pleasant as well as profitable for us to study its habits. Perhaps you have been accustomed to look upon ants, annoying as they sometimes are, with aversion and disgust ; but we shall find so much to admire in their life, that we shall soon learn to regard them with interest, nor shall we grudge them the little morsels they may appropriate from our overflowing stores.

There are many species of ants, from the harmless ones common among us, to the poisonous black ants, and destructive termites, or white ants, of tropical climates. But the habits of the different species are so similar, that the same general description will apply to all.

Every community of ants contains three dis-



Male.



Female



Worker.

tinct sexes : the males, which always have four wings ; the females, much larger than the males,

and having wings only in the pairing season ; and a third kind, variously called neuters, workers, or nurse-ants, which are destitute of wings, at all times.

As their name indicates, the workers perform the labor of the community. They collect supplies of food, exploring for this purpose the adjacent fields, and seizing upon all animal substances, living or dead, which they can move ; they construct the dwelling with its curious rooms, galleries, arches, and pillars ; they keep it in good repair, protect it from storms, and defend it from enemies ; they attend upon the hatching of the eggs ; they feed the young, and move them, as occasion may require, to different places ; they fight all the battles of the community, and provide in various ways for the comfort and safety of their weaker companions. Are they not properly named “workers,” and are they not the most important members of the family ?

So among men, the “worker” — with hand or brain — is always the most valuable person. Idlers are useless, and living upon the labors

of others are simply burdens. Be a worker in the world and not a drone!

The males and females are easily distinguished by their white glistening wings, and early in the pairing season they may be seen in great numbers in and about the ant-hills, and mingling with the wingless workers. There seems to be a singular disposition among the males and females to desert their home, while the workers seem equally desirous to prevent their escape, and never yield the contest unless greatly outnumbered. The industrious, laborious ants watch these truants very closely, posting regular sentries, and never allowing them to pass beyond the limits of the colony without a guard. It is not unusual to see three or four sentries dragging back some deserter by the wings. Thus with all the daily house-work of the family, the outdoor labor, — the building, protecting, fighting, and sentry duty, the little workers have certainly cares enough.

They are also very attentive to the queen or queens, for there are often several of these royal personages in one community. The monarch

seems to have no authority; yet she is treated with the greatest respect and kindness. Wherever a queen goes, the ants crowd around her, offer her food, carefully brush her dress, assist her over hard places, and through all narrow passages.

Did any of the young readers of this book ever make a little "saddle," as children call it, by crossing hands with a playmate, and on the seat thus formed did they ever carry a third person with ease and safety? The ants do something very similar to this. They join their mandibles, or projecting jaws together, thus making a very comfortable seat, and carry the queen from place to place with great care and tenderness, and perhaps with pride. And perchance, too, the queen, as she securely rides in this ingenious carriage, thanks her attendants for their kindness. All deeds of affection, all evidences of good-will, should call forth gratitude, and we should never receive a favor without feeling grateful for it. Most of all, should our hearts rise in thankfulness to our Heavenly Father who is good to all, and whose tender mercies are over all his works.

If the queen makes a journey through the apartments of the dwelling, the workers leave their occupation and manifest great joy at seeing her; they pat her upon the head and breast, and standing upon their hind legs, and laying hold upon each other's shoulders with their fore feet, they form a circle around their monarch, and dance in high glee. What can be more amusing than the sight of ants joining hands and sporting around their queen! Surely the little insects must have some idea of pleasure.

The peculiar office of the queen is to lay eggs. These are picked up by the workers as soon as they are deposited, and carried to a place of safety. The eggs of ants, unlike those of other insects, are not fastened to any one spot, but are scattered about in parcels of six or eight, loosely attached to each other. During the hatching season, the great work of the female and nurse-ant is moving the eggs to places best suited for this purpose, the little insects seeming to know the precise amount of heat necessary for the accomplishment of the end in view. If the reader has ever watched an ant-hill in the summer time,

he has seen the inmates hard at work in swarms, carrying to and fro numerous white masses, which seemed altogether too large for them to bear. These are the eggs, which the ants move with great care, exposing them during the day to the warmth of the sun, and taking them at night beyond the effects of cold and dampness. From this habit arose the mistaken idea that the ants were laying up stores of food for winter use. Ants are torpid during the cold weather, and consequently they then require no food of any kind.


After the eggs are hatched, the young ants are tended with even greater care, as they are more susceptible to injury from heat than the eggs. While young, like all children, these grubs are hungry beings, and not only eat food sufficient for their growth, but for the formation of the silken cocoon which they afterward spin. They are fed by the nurse-ant, or by the female, when she is destitute of servants, with a liquid food secreted in the stomach of the parent.

If the mother is alone with her family, she is obliged to labor very hard to provide food for the

twenty hungry mouths that are dependent upon her ; but with genuine love for her children, she, like our own mothers, works early and late to supply the wants of the little ones, and thinks no sacrifice too great for their good.

As soon as the grubs have attained their full growth, they spin cocoons of a brownish white color, which resemble grains of barley, and for centuries were mistaken for them ; as we have just seen the eggs were once thought to be the stores of winter food. These cocoons are treated in the same way as were the eggs, being carefully moved about from place to place that they may have the proper amount of heat. When the time arrives for the second birth of the insect, the nurse-ants open the cocoons and release the little prisoner, who comes forth, — male, female, or worker, as the case may be. What determines the kind of ant is a mystery beyond our knowledge ; — in this the ants are wiser than we.

The nurse-ants evidently know that the perfect insect is ready to appear, but too weak to effect its escape alone. How they ascertain this, we



can not tell. We only know that God provides for all his creatures, giving them wisdom for every circumstance of life, and he never neglects the work of his own hands. If he has endowed the ant, which is comparatively so insignificant an animal, with such wonderful instincts, what must be the value of the soul of man !

When the time approaches for the little brood to come forth, all is bustle and excitement in the nest. Three or four ants mount upon one cocoon, and begin to open it where the head of the infant lies, and apparently with great caution. The first effort is to thin that part by pulling off a few threads. Several small openings are then made, next they cut the threads one by one, very patiently, until, with the utmost gentleness, a hole is made through which the prisoner escapes. But the wings and limbs of the young ant are still bound by silken cords. The workers however soon cut these, carefully releasing every member from its bondage, and giving to the insect full freedom of life.

Now commence the labors of the nursery. For several days the workers follow and watch

the young ants everywhere, showing them the paths and windings of the dwelling, and cherishing them with the greatest care. They also perform the difficult task of stretching the wings of the males and the females, which would otherwise remain folded up. They do this so carefully as not to injure in the least these frail and delicate organs. When the young ants take their first flight, the workers accompany them to the summit of the highest herbs, still exhibiting the tenderest solicitude. Sometimes they endeavor to retain them, feeding them for the last time and caressing them. At last the little insects rise into the air and disappear, and the workers lose for ever the sight of those over whom they have watched so tenderly. The males die very soon after reaching maturity. They are helpless, tender creatures, compared with the other members of the family, and the first rough wind or storm kills them.

It may be asked what becomes of the mother of the young ants, and why does the care of the infants devolve upon others rather than her? To this it may be answered that like every thing

else in God's creation, the economy of the ant-community is perfect of its kind. God's law is over all things, his unity of design is every-where manifest ; but the diversity of details is marvellous. There are innumerable matters which are unintelligible to us, and the only answer we can ever obtain this side of heaven is, that God so made them. If the mother-ant seems to neglect her young, all we can say is that such is the economy of the ant-family. We see that if this is a neglect on the part of the parent, it is wisely ordered that the workers faithfully perform all that is necessary to supply the deficiency. But it is not reasonable to suppose that the mothers are wanting in affection. When a colony is founded, they have enough to do to supply it with eggs for future males, females, and workers. These she lays at three different seasons, — and here is her appropriate sphere. Her work is faithfully done. Unlike too many human beings, she betrays no trust : she performs promptly and well, and at the proper times, whatever is required of her. When the nest was first formed she did all that such a mother could do ; and it

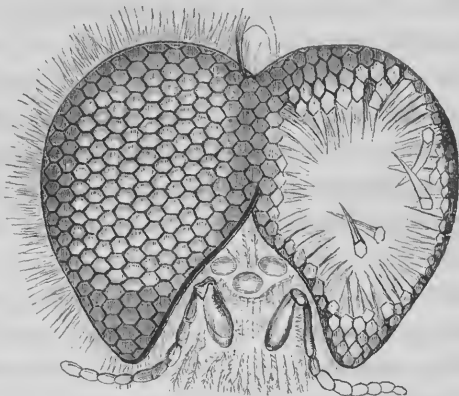
was only when the workers became sufficiently numerous to perform their proper tasks, and relieve her, that she left the young to their charge, and employed herself in increasing the colony. When a female first issues from the chrysalis, she is adorned with two pairs of wings, — one pair being larger than her body. But when ready to lay her eggs, she turns and twists her wings until they finally drop off, and then gives herself wholly to the work committed to her.

The eyes of ants, like those of most other insects, when examined under a microscope, are seen to consist of a great number of hexagonal or six-sided facets.

On the left, is seen an eye in its natural state, and on the right, the same sufficiently deprived of its exterior to show its internal structure. As the eyes of insects are not movable, these many facets, each acting as an eye, serve as thousands of little eyes, looking in all directions, each reflecting distinctly the object before it.

Ants have been discovered entirely destitute of eyes, or, at least, with no appearance of any. One species of this description is a dweller in

the forests of Guiana, and is little known. Another is met with in France, which hides



A compound eye greatly magnified.

itself in dark places during the day, and comes forth only at night.

The sense of smell in ants is very acute, guiding them to their food, and enabling them to follow in the path of their companions. If the end of one's finger be passed across their line of march, so as to brush off the scent which the preceding ones have left, those that follow will stop at this place, and proceed irregularly

until they have passed over it, when they soon "strike the trail" again, and proceed on their way as confidently as before. Sometimes, however, they get confused.

A gentleman observed an army of ants stretching over the ground for several yards, crowded through its whole extent with foragers and scouts, and marching toward a well-peopled ant-city. He drew his walking-stick across their path several times, and all were instantly thrown into the greatest confusion, and wandered about as if blindfold. He remained some time watching their movements, but they did not succeed in forming again into regular line, although most of them reached their destination by a round-about course.

The strength of these little creatures is surprising. If the reader will watch any ant-hill, or the ground around it, he will be astonished to see the loads the ants will carry or drag, often exceeding in size many times their own bulk. A gentleman has in his cabinet an insect, to one of whose legs a small ant, scarcely a thirteenth of its size, is fixed by its jaws. The little ant had probably

dared to attack this giant, and refusing to let go its hold, had starved to death. Two or three ants have been observed dragging along a young snake, not dead, which was of the size of a goose-quill.

Their ingenuity and skill in moving large bodies is no less remarkable than their strength. They will drag off immense spiders with apparently the greatest ease. To do this they stretch out two of the spider's legs, pulling upon them with all their might, then they seize another pair of legs on the other side and do the same, sometimes turning what must be to them an unwieldy mass completely round. Oftentimes a single ant may be seen perched upon the back of the spider, acting as an engineer, and directing all the movements. The little insects appear to have learned the important lesson, never to be in each other's way, nor do they seem to expend any needless exertion in their labors.

Sometimes a lazy ant will attempt to evade its share of labor and manifest symptoms of indolence or rebellion. Such an one is quickly detected and watched by the rest, and if it runs

off is pursued, caught, and brought back to its work. After thus capturing one of these idlers two or three times, the ants, as if enraged at its laziness, and determined that each one shall bear an equal share of the hardships of the community, have been known to kill the idler by cutting off its head.—If all human idlers were treated in this way, what destruction of life there would be !

The perseverance of ants is most remarkable. They seem determined to complete whatever they begin, and if their work is destroyed, they quickly begin again, and never appear to be discouraged by any accidents or obstacles.

The swampy portions of Paraguay are inhabited by a little black ant, whose nests resemble conical hillocks of earth placed very near each other, and about three feet high. When a flood takes place, these insects are said to gather themselves into a circular heap about a foot in diameter, and ten or twelve inches in depth, and, thus massed together, they continue to float so long as the flood lasts. One side of the heap is fastened to some sprig of grass or piece of wood, and the

ants return to their dwelling when the waters have subsided. When they wish to pass from one place to another, they may often be seen formed into a bridge of six or eight inches in length and an inch in width, and which has no other support than that of its two ends.

The distinguished naturalist Huber tells us that ants communicate with each other like bees, with their antennæ, or feelers, and that by the language thus spoken, or the ideas thus conveyed, they assist each other in their wants, labors, dangers, and pleasures. Many facts are recorded which plainly show this to be true. Some ants discovered in a gentleman's house a closet where preserves were kept, and they constantly visited it until the supply was exhausted. One of the insects, in its rambles, must have first found out this sweet treasure, and then told its companions. They always went to the closet by the same track, although they were obliged to pass through two rooms, nor did the sweeping and cleaning of the apartments arrest them, or cause them to take a different road.

Smith, in his "New Voyages to Guinea," says

that ants "certainly have some method or other, whereby they easily make themselves to be understood, as I have often experienced in the following manner: When I have seen two or three straggling ants upon the hunt, I have killed a cockroach and thrown it down before them. As soon as they have found out what it was, they have sent one away for help, while the others have stayed and watched the dead body, until he returned at the head of a large posse; and if they have not then been able to remove the cockroach, another ant has been sent away who has soon returned with a fresh supply sufficient to carry off the prey."

In the "Transactions of the French Academy," an account is given of a solitary ant that was taken from its nest and thrown upon a heap of corn. It seemed attentively to survey this treasure, and then hastened back to its former abode, where it doubtless told the good news of the discovered food, for an immense host of ants quickly made its appearance, and commenced carrying away the corn.

Many instances similar to these might be given,

but we only designed to present sufficient evidence to show that ants have some method by which they interchange ideas. With a little play of the imagination we can think of these insects, consulting together upon their household matters upon plans for the future, and all the subjects that would naturally arise in their little family. But can we think of the ants and of their language without supposing the insects to have ideas and thoughts, and do we not thus unconsciously raise them into the scale of intelligent beings? They have, like us, a world of their own, beautiful, convenient, and well adapted to all their wants, and they are endowed with social capacities, enabling them to live in well-ordered and happy communities. How easy it is to give importance and dignity to the least of God's creatures!

It may truly be said that the ants of one community live very happily together. They evidently possess a high degree of family affection, and if any of the number have been absent for some time, they are welcomed upon their return with every indication of joy.

Huber gives a pleasing illustration of this. He took some ants wild from the woods and placed them in a glass hive; but finding them too numerous he allowed some to escape. These soon built a nest in the garden. Carrying the hive into his study, he watched the habits of its inmates for four months, after which he placed it in the garden within fifteen paces of the others. The garden ants immediately recognized their former associates, caressed them with their antennæ, or feelers, and taking them in their jaws led them to their own abode!

Like all animals, ants sympathize with each other in suffering. An eminent naturalist once cut off the antennæ of an ant. He afterwards observed another ant approach, caress it with seeming tenderness, and pour a drop of liquid from its mouth into the wounds. Does not this resemble human sympathy?

It is equally obvious that they love to promote each other's pleasure and comfort. Huber, on one occasion, increased the heat in a part of a nest by means of a torch. The ants that happened to be near, after enjoying the warmth for a

time, hastened with the news to their companions. So desirous were they that others should partake of the pleasure, that hundreds were seen conducting their friends thither.

“We see, then,” he adds, “that insects which live in society are in possession of a language; and, in consequence of enjoying a language in common with us, although of an inferior degree, have they not greater importance in our eyes, and do they not embellish the very spectacle of the universe?”

CHAPTER II.

Yellow Ants. — Their Nests. — Their Ingenuity. — Herd-keepers. — Plant-lice and Honey-dew. — Care of Yellow Ants for their Herds. — The Jet Ant. — Their Nests.

HAVING described the ant in its general characteristics, we will now notice some of the different species, and the habits peculiar to each.

YELLOW ANTS.

This species usually selects some little hole or depression in the earth, and over it builds its well-contrived house. The roof is dome-shaped, but not solid. Within this roof and in the earth below it are many rooms and passage-ways, skillfully excavated in the solid ground. To support these apartments, sustain the ceiling, and make the desired separation of rooms, the little builders leave portions of the earth standing, which serve as posts, beams, and rafters. Arched door-ways are also cut, and small side-rooms made, and in fact all the convenient arrangements of a well-

contrived house are to be found in these insect structures. Halls or corridors lead to the open air, and are carefully closed at night for the greater security of the household. The chambers are usually low, yet sufficiently large for all the necessities of the occupants. In their construction the insect is guided by an unerring instinct, and makes no mistakes in providing for all the wants of its domestic life. The different rooms are connected by little galleries, which are always built with the strictest regard to convenience and use.

If the houses were constructed of the little pellets of sand in their dry state, they would soon be seriously damaged, if not wholly destroyed. But to provide against such calamities, the ants, as they build, moisten the earth with rain-water. The heat of the sun hardens the masonry, and thus the house is so completely bound together, so firmly joined in all its parts, that portions may be taken away without injury to the rest.

This process also secures a safe defense against the weather. "I never found," says Huber, "even after long and violent rains, the interior of

the nest wet to more than a quarter of an inch from the surface, provided it had not been previously out of repair, or deserted by its inhabitants."

There is one large chamber, or hall, situated nearly in the center of the building, much loftier than the rest, and crossed only by the beams that support the ceiling. This seems to be the grand room of the family. All the galleries terminate here, and it is the gathering place and usual residence of the ants. When we recollect their remarkably social nature, as described in the preceding chapter, it is easy and pleasant to imagine how they enjoy themselves when assembled in this large room; and how when their plans are made, and their little discussions ended, they separate, and run off through the many avenues that lead from it to the other parts of the house.

These ants are very ingenious in adapting themselves to the circumstances in which they may be placed, and seem at no loss for expedients to surmount obstacles. A naturalist recently observed a nest of one species of green ants built between the stems of way-side plants, and par-

tially suspended by them over a stream of running water. This singular nest is represented in the engraving, and is a striking instance of the ingenuity of the little insects.



Singular Nest of a Yellow Ant.

ANT HERD-KEEPERS.

Perhaps the reader smiles as he sees this heading ; but we have a marvelous fact to de-

scribe under it, and one in which the student will not fail to be interested.

Various kinds of ants keep and feed certain insects as we keep cows, for the sake of obtaining from them a sweet and nourishing liquid, which may be called milk ; and we find the yellow ant to be the most extensive cow-keeper of all. This is a singular statement, but naturalists have shown it to be true in all respects.

However indifferent you may be to the minutæ of Nature, have you not often, when about to pick a rose-bud, or a geranium leaf, or a sprig of honeysuckle, almost shuddered to find upon it either a green mass of moving life, or leaves turned black to the eye, or clammy to the touch ? Or perhaps you have turned up a fresh-looking leaf, and seen upon the under side numerous green insects. These are called Aphides, or Plant-lice. Every one who is familiar with flowers knows too well this destructive creature. But to destroy is not its only office : the insect is a producer of food.

Most of the readers have heard of honey-dew, and know that it is a sweet, clammy substance

found on the leaves of various trees and plants. Opinions have differed as to the real nature of this poison to the plant, but it is now ascertained that like the honey of bees, it is extracted with the sap, secreted and then thrown out by the aphides in a state of the greatest purity. Besides this profusion of sweets which they scatter around them, they always keep a good supply in their bodies, which resemble little green jars.

These aphides, or plant-lice, are the "cows," and the honey-dew safely preserved in the green bottles, is the "milk" referred to.

We have already seen that the ant lays by no food for winter's use, as the insect requires none during the long, cold months. But they have a provident instinct for the future, which leads them to keeping and tending their herds of aphides. They collect the eggs of the plant-lice, and deposit them in the warmest parts of their nests, and guard them with the greatest care, that they may hatch early, and so the supply of milk be abundant in the spring. There are a few ants, however, that seem to be ignorant of the process of hatching the eggs, but the econ-

omy of the nest prevents any lack of food. Some of the ants find the "cows" in their hiding-places, milk them, and returning home, distribute the sweet nourishment among their companions.

The herds of the yellow ant are large and well kept. They are pastured on the branches and leaves of neighboring shrubs and plants, and are carefully guarded from intrusion. Sometimes a wall of clay is built around the stem of the plant for their protection. It is a singular fact, and may almost be said to approach human wisdom, that these ants often keep a few aphides close at home, or even under their own roof, as if for convenience, feeding them from the provisions of the house, or allowing them to graze upon the herbage near by.

The process of "milking" is rather peculiar: The ant touches the "cow" gently with its feelers, first upon one side, and then upon the other, and the well-fed insect immediately gives out two drops of the clear, sweet fluid already described as honey-dew, and which is sufficient for the wants of the ant. No farmer can be more careful of his flocks, and more attentive to their

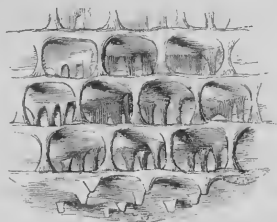
necessities and comforts, than the ants of these little cows, and their whole treatment is a perfect picture of similar scenes in country life.

THE JET ANT.

This ant is of a fine, shining black color, and its colonies settle in the trunks of decaying oaks or willows. They always work in the interior of trees, or of their roots, and seem very desirous to be screened from observation. Their only tools are their jaws, and with these they chisel out horizontal galleries, following the circular direction of the layers of wood. These galleries are separated by extremely thin partitions, and connected by a few oval doors. Separate chambers open from the passage-ways. Nicely cut pillars, at first arched at both ends, and then chiseled into regular forms, support the ceilings, and often stand in long rows, making a beautiful colonnade.

This intricate net-work of little rooms and galleries is extended to several stories. The floors are very uneven, owing, perhaps, to the varying texture of the wood. The grooves, or depressions in the floors, however, are turned by the ants to

great advantage, as they retain the larvæ in safety.



Galleries of the Jet Ants.

The houses which these ants build in the roots of trees are much more irregular than those cut out of the trunk. But if not constructed so systematically, they are much more delicate. Fragments of houses made in the roots of trees, or in that part of the trunk of the tree nearest the roots, have been seen eight or ten inches in length, and of equal height, containing a number of apartments, with partitions as thin as paper. Near the entrance of these, wrought out with great care, are openings of considerable size. But in the place of chambers and extensive galleries, the layers of the wood are hewn in rows of little arches, allowing to the ants free passage in

every direction. These may be regarded as the gates, or entrances to the various dwellings.

It is a singular circumstance in the abodes of these ants, that all the wood which they carve is tinged of a black color, as if it had been smoked. This certainly does not add to the beauty of their streets, which look as dark and solemn as the old and narrow lanes of a city. The cause of this smoky tint has not been ascertained, although naturalists have tried to investigate it. It is peculiar to the excavations of the Jet Ant.

CHAPTER III.

Warrior Ants. — Slavery among Ants. — Slave-catching Expeditions. — Color of the Slaves. — Desperate Battles among Ants. — Sin of Slavery.

WARRIOR ANTS.

THERE are several kinds of warlike ants, especially the wood ant, the Amazon, or warrior ant, and the sanguinary ant. All these sally out on hostile excursions for the purpose of capturing and bringing home to their own colonies the eggs and cocoons of other tribes, generally of the dark-colored or dusky ant.

It must strike the reader as very singular that these ants are genuine slave-owners, and have a system of slavery similar to that practised among human beings. But the little slave-holders are not so cruel as human masters. No sound of the whip is ever heard in their country; no punishments are inflicted; the slaves live as well as their masters, and sometimes seem to take the whole authority into their own hands.

The little slaves are exceedingly industrious. No maids-of-all-work, — for the slaves are all females, — can excel them in universal usefulness. The owners are principally females, also, and, without exception, are soldiers, — Amazons. And as these lady-warriors do nothing, the slaves must, of course, do everything. They are the builders, the porters, the scavengers, and the nurses. They are even the feeders of the grown-up community, which consists of the lady-soldiers, a few idle gentlemen, and two or three princesses.

The slave population being thus necessary for the comfort and even existence of the community, it is most important to keep their number full. Thus we find a complete system of slave-traffic, or slave-capture, for the ants do not purchase, but steal their slaves. The soldiers make excursions to some neighboring ant-city, attack and conquer the inhabitants, and return, each bringing an infant captive.

Upon its arrival at the city, the young slave is given in charge to a nurse, herself a slave, and who, although ignorant that the little stranger is united to her by the ties of country, and perhaps

of family, fondles it, and feeds it, and trains it for its future duties.

Naturalists describe the slave-catching expeditions of ants with great minuteness. Huber, after speaking of the spirited combats between different species, describes the war-parties sent out to steal the infants from the settlements of the *formica fusca*, or dusky ant, and says, — “Many curious circumstances mark these expeditions. There is reason to believe that these ants first send out spies, who describe the route to be taken. They push each other with the head or jaws, or play with the antennæ or feelers, perhaps to arouse to effort, or tell what is soon to be done.

“They start about five o’clock in a warm summer afternoon, eight or ten ants being usually in the advance; but no sooner do they pass beyond the nest, than they move back, wheel round in a semicircle, and mix with the main body, while others succeed to their station. All in their turn pursue the same course; and after passing through the grass for about thirty feet, they disperse, and like dogs on the scent, explore the ground with their antennæ.

“Soon they discover the colony of which they are in search. Its sentinels dart upon them with the utmost fury; crowds rush forth from their various avenues; but the besiegers compel them to retreat, and by breaching the walls, or entering the gates, advance into the city. In a few minutes they appear again, each one carrying in its mouth a caterpillar, or a chrysalis, and return home the way they came.”

Facts like these present so many points of resemblance to similar scenes enacted by human beings, that we will describe a slave-catching expedition, speaking of the ants as if they were real warriors and genuine slave-catchers. Although, in order to give animation to the description, imagination will supply many of the details, still care will be taken that nothing is exaggerated or misstated; and the reader will find that in the narrative, many of the habits of the ant are carefully noticed, and will need no repetition elsewhere. We have borrowed, to some extent, the language of another writer, in this description.

A SLAVE-CATCHING EXPEDITION.

It was toward the close of a fine summer day, that the army of the Rufians (*formica rufa*), consisting of a large body of infantry, was seen issuing from the gates of their capital. Their march soon brought them to a dry, sandy plain, strewn with rocky fragments, through which they pursued their way in winding but unbroken files, their polished brown corselets glistening like sparks of fire in the glow of the declining sun. Marching with great rapidity, they soon crossed this desert-like tract without loss or accident, — a cause for great rejoicing, considering the many dangers to which their exposed route had subjected them. For what appeared to them merely a rock-strewn plain, was in fact a public road, used by gigantic creatures who considered themselves the lords of the land, and had one of these passed this way during the march of the Rufians, he would have crushed from existence whole divisions of their army by a single footfall. But they escaped these and other perils, and at last arrived at what we should call a hedge, or thicket, but

which, to them, was a mighty forest. It required no little skill to cross this barrier, and re-form their army upon the other side ; but it was done in the most creditable manner, which is the more surprising, as they seemed to be destitute of any leaders or officers.

Leaving the dense forests in their rear, they pressed forward into a country which presented obstacles even greater than those already overcome. Imagine a body of infantry compelled to force its way through a thick growth of wood, composed of trees so large that the smallest of them was more than three times the size of any of their bodies ; so high that they could scarcely see the tops, and all these thickly set with gigantic leaf-blades waving and clashing above their heads, or lying across the path in great confusion, obliging the soldiers to climb over, or creep under them. Imagine the difficulties of such a march to a single individual, and then think of the hundred-fold trouble and danger to an army compelled to keep together and proceed in a definite course.

But the army marched bravely on through the

unmown field, for what seemed trees to them was only tall grass, and when night came on, they lay down and rested for the morning's labor.

They had not gone far the next day, before they saw the dome of the city of Fusca (*formica fusca*, or the brown ant) which they were to attack. All was now animation throughout the ranks. Their march was hastened in order to surprise the city, if possible, while some of the bravest and most ardent rushed forward to secure the enemy's sentinels, who were stationed at each of the avenues leading to the city.

These guards, who immediately gave notice of the approaching army, were, like their assailants, soldiers, only of a much more peaceable disposition, — never fighting except in self-defence. Among the Fuseans, slavery does not exist; and their working females, who constitute the greater proportion of the population, are not only the sole defenders of the community, but also perform all those duties which the Rufians require of their slaves.

When the Fuseans heard from their sentinels that an enemy was near at hand, they were busy

about their usual duties. Some had just commenced their day's work at building, some were cleaning the streets, some were feeding the cattle and milking, some waiting on the nobles of the city, some giving breakfast to the children in the nurseries, and thus in one way and another, the whole city was intent upon its regular work.

Although thus taken by surprise, the Fuscans, if not fore-warned, were fore-armed. Like the ten knights spoken of by the poet, who

—“quitted not their harness bright,
Neither by day, nor yet by night,”

they ate, drank, worked, and nursed their young, in full armor. They never lay aside their arms, and always carry their ammunition with them. Having, therefore, no belts to buckle, no guns to load, no horses to saddle, their troops soon collected and issued forth in various divisions from the city gates. Few remained behind, except the cowardly and the helpless. There were the idle men of the city, who always hung about the court, and never did any work for the common good,—the numerous infant families which claimed the

queens for mothers, and the queens themselves with several princesses. Beside these there were a few who were compelled to stay in the nurseries, and the royal body-guard, — a little Amazonian band as brave and faithful as the old Swiss Guard of the unhappy King of France.

A fierce battle rages. The Fuscans are drawn up in front of their city, fighting for their queens, their lives, and the liberty of the infant population. Their assailants are fighting for glory, and for plunder, especially to seize the infant Fuscans and carry them into slavery. The Fuscans excel in numbers, but are inferior to their enemies, in size, discipline, and strength. The battle-field, an area of about four feet square, is covered with the dead and dying. Single-handed fights by thousands are going on, and the duelists, wholly unmindful of all else, and having exhausted their ammunition, grapple in close contest, and hold fast in savage grip until a third party comes and turns the balance. In another part of the field, may be seen, perhaps, a dozen combatants of either party, all firmly linked in a living chain, and fighting until death ends the scene.

A Fuscan has been known to leap upon a Rufian, and take such firm hold with her jaws that although the Rufian tore his antagonist asunder, the head and upper portion of the body still clung to him, and he must wear this hideous ornament until death. So terrible is the hold these Fuscans take upon their enemies.

But how goes the day? How turns the tide of battle? Shall the infant Fuscan females grow up to be *maids* of all work at home, or *slaves* of all work in a foreign land? At last the Fuscans run! They can not sustain themselves against the superior skill and strength of their assailants, and having fought nobly, and until they see that the Rufians are making preparations to attack the city itself, they retreat to the dome-covered citadel, there to make a last stand. Reaching the roof, the shattered remnant of the army rapidly defile downward through the descending streets. But the enemy follow close; and hardly have the worn-out Fuscans gained the inside of the citadel before the Rufians take possession of the principal entrances, and sappers and miners open breaches in the masonry of its dome, and soon

the whole invading force rushes into the devoted city.

The queens, shut up within their palaces, are defended by their faithful body-guard, and although the mothers of the infant brood, they make no effort for their safety. But the loving foster-mothers, at once the tender nurses and the brave defenders, still fight for the little ones. Their deeds of heroism would honor human beings. Wholly forgetful of self, they think only of protecting the Fusean babes. A Rufian enters a room where ten of the little ones are committed to the care of one nurse. Upon her the enemy rushes, bears her to the ground, and cutting off her lower limbs, snatches up two of the infants and retreats. But life and affection are still strong within the dismembered body of the nurse. Unmindful of her own agony, she slowly hides the little ones still left, and when the last one is safely concealed, as she thinks, she falls and dies.

Triumphant is the homeward march of the Rufians, each soldier leading a captive. Regular order is neglected, and they reach their city

by different routes and in straggling parties. When they approach their homes, the slave sentinels give joyful notice of their return, and the slave nurses receive the little captives into their charge.

Thus ends the slave-catching expedition of the ants.

The reader will not fail to have noticed the remarkable coincidences between the habits of the ants in respect to slavery, and of men ; a coincidence extending even to the color of the unhappy victims, — for it is only a dark or nearly black insect that is thus reduced to bondage. But this practice is much more becoming this irrational insect than he whom God has made in his own image. Let no one forget that he “hath made of one blood all nations of men ;” that he has given to all immortal souls, and that Christ came into the world to save sinners of whatever color. Thousands of pious hearts have throbbed beneath a dark skin, and many a Christian slave will sit down at the right hand of God while the white master will receive the punishment due to him who has wickedly abused a fellow-being.

CHAPTER IV.

Termites, or White Ants. — The Female. — Destructiveness. — Nests of the White Ants. — Their immense size. — Lessons of perseverance. — Conical nests. — Their structure. — Turret nests. — Their structure. — The Soldier Ant. — Spherical and oval nests. — Difficulty of driving Ants from houses. — Difficulty of overcoming bad habits.

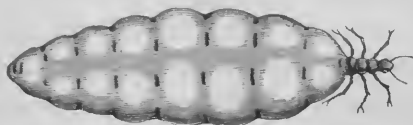
TERMITES.

TRAVELERS in tropical climates describe many species of ants, some of which are so terrible to man, and even to the beasts of the forests, from their venomous bites, fierce temper, and voracity, that their path is freely abandoned to them, and they are avoided in every possible way. Du Chaillu, in his explorations in equatorial Africa, met with ten different species of this description.

Of these the termites, or white ants, present the most interesting characteristics. Strictly speaking, termites are not ants, but as they are popularly so called, and in their habits so closely resemble the little insect we have been considering,

we shall, in common with most writers, speak of them as such.

As we have noticed in other species, the female is the most important member of the family. No sooner is a colony established, than she supplies it with a large population. Her size increases until she becomes many hundred, or even thousands of times, larger than her subjects, and she often lays eggs at the rate of sixty in a



The Female of the White Ant.

minute, or more than eighty thousand in twenty-four hours.

While the female is thus busily engaged, her chamber is a scene of great activity. Crowds of attendants or servants are passing to and fro, taking the eggs and carefully transporting them to their proper places in the nurseries. Food is furnished to the young brood until they can procure it themselves, and the nursing and training

is conducted in much the same manner as has been described in previous chapters.

Few, if any, insects are so destructive as the termites. When they once gain possession of buildings, nothing but glass or metal can escape their ravages. They devour every thing that comes in their way, — but wood is their favorite food. Sometimes they will enter a house in so great numbers that every article in a spacious apartment will be destroyed in a single night. They leave the exterior unmolested, but within it is so thoroughly sapped and mined that it is nothing but a shell, ready at a touch to crumble into dust. The termites love darkness, and prefer to work screened from observation; hence, they seldom attack the outside of solid substances until they have first concealed it and all their operations with a coating of clay.

A single instance will serve to illustrate the destructive nature of these insects. A surveyor, having returned from a journey, left his trunk on a table in his room. The next morning, not only did he find all his clothes devoured, but his papers also were destroyed, not a piece half

an inch square being left. A piece of silver coin that was in the trunk had a number of black spots upon it, caused by something so corrosive that they could not be removed even by sand. The black lead of his pencils was also consumed.

The termites are not more than a quarter of an inch in height, but they erect houses of such magnitude, and so perfectly adapted to all their wants, that we are filled with wonder.* The structures of wasps and bees, and more especially of the wood-ants already described, when placed in comparison with the size of the builders, equal in magnitude our largest cities compared with the stature of man. But when we look at the buildings erected by the termites, the homes of other insects sink into insignificance.

Kirby says, "They far exceed the most boasted works and structures of man. For did these creatures equal him in size, retaining their usual instincts and sagacity, their buildings would soar to the astonishing height of more than half a mile, and their tunnels would expand to a magnificent

* See Frontispiece.

cylinder of more than three hundred feet in diameter. Before these the pyramids of Egypt and the aqueducts of Rome would lose all their celebrity and dwindle into nothingness."

Dr. Livingston, the celebrated traveler in Africa, in speaking of a particular section of that country, says, — "It abounds in ant-hills. In the open parts they are studded over the surface exactly as hay-cocks are in harvest. In the woods they are as large as round hay-stacks, forty or fifty feet in diameter at the base, and at least twenty feet high. They are more fertile than the rest of the land, and here they are the chief garden ground for maize, pumpkins, and tobacco." In another place he speaks of seeing the hills of the white ants thirty feet high, "and of a base so broad that trees grow on them." Barth, another traveler in Africa, mentions ant-hills two hundred feet in circumference at the base. Indeed so immense are the structures of these ants that early writers supposed they must be the work of large animals; and so they tell us of monstrous ants in India as large as foxes!

A collection of these ant-hills bears no faint

resemblance, as the reader can readily imagine, to an Indian or African village, and they are in fact often mistaken in the distance for the huts of the natives. Their construction is curious, and shows the wonderful skill of the architects.

Two or three towers or posts of clay, about a foot in high and shaped like a sugar-loaf are first raised. These rapidly increase in number and high. They are broad at the base, at the top joined together with a dome-shaped roof, and surrounded with a thick outer wall of clay. The fertility of the earth, as Dr. Livingston remarks, seems to be greatly increased by being worked over by the ants in the process of building, and the mound is soon covered with a fine growth of grass, and then has a strong resemblance to the heaps of hay in a mowing field. The inner towers, with the exception of the tops, which project from different parts of it, like pinnacles, are then removed, and the clay worked over again in various ways.

The ants occupy only the lower parts of the building. The dome-shaped roof, which is very strong and solid, serves as a defense from the

weather and the attacks of enemies, and also to secure the warmth and moisture neeèssary for hatching the eggs and nourishing the young.

So strong are these roofs that wild animals mount them and stand as sentinels on guard while the herd is feeding below. Travelers too, on the sea-coast, often use them as "look-outs" in watching for vessels.

In the center of the building is the royal chamber. This is an arched vault, at first not more than an inch long, but is enlarged in size as the queen grows to the length of eight inches or more. Within this room the queen always dwells, as the entrance is too small to allow her to leave. Adjoining this chamber, and entirely surrounding it, are what are called the royal apartments. These are arched rooms of different shapes and sizes, opening into each other, or connected by passage-ways, and are usually occupied by many thousand soldiers and attendants in waiting upon the queen. Opening from these apartments are the nurseries, filled with eggs, and the young. At first these are placed close by the royal chamber, but when the queen requires a larger room,

and more attendants, they are taken to pieces and rebuilt at a greater distance, and increased in number and size. Their construction is peculiar; they are built of particles of wood apparently joined together by gum, or some sticky matter. A group of these chambers, each not more than half an inch wide, is enclosed by an apartment of clay into which they open. Other rooms, or magazines, always well stored with provisions, are intermixed with the nurseries. These are sometimes separated by empty chambers and galleries, and often communicate with each other either directly or by little passages, and they extend on all sides to the outer wall of the building, and almost to the top of it. They are, however, confined to the sides of the lower part of the nest, leaving an open area under the dome. A flattish roof covers the top, and the area, which is a little above the royal chamber, has another, also waterproof, and so made as to let any rain that may chance to get in run off into the passages underground. Some of these are more than a foot in diameter, perfectly cylindrical, and lined with the same kind of clay of which the hive is composed.

They slope to the depth of three or four feet, and then, branching out on all sides, are carried underground, near the surface, to a great distance. These are the great thoroughfares for the ants, through which they carry their clay, wood, water, or provisions. They have a spiral and gradual ascent, because it would be difficult for these creatures to ascend a perpendicular. In some parts a flat pathway, half an inch wide, is often made to wind gradually, like a road cut out of the side of a mountain, by which they can easily travel, when otherwise it would be impossible.

There is another display of ingenuity to shorten labor. A kind of bridge, of one large arch, springs from the floor to the upper apartments, answering the purpose of a flight of stairs. Thus the journey required for carrying the eggs from the royal chamber to the upper nurseries is very much shortened. In some cases this would be four or five feet in a straight line, and much more if carried along the winding passages which lead to the different chambers.

An examination of an ant-hill disclosed one of these bridges, half an inch in width, a quarter

of an inch thick, and three inches in length. With the skill of true architects this bridge was strengthened by a well-built arch. There was also a hollow or groove the whole length of the upper surface, which was made for the greater safety of the little passengers, or had been worn by constant travel.

There is another species of white ant which



Turret-nests of White Ants.

erects a very curious dwelling. It is similar in shape to a mushroom, being a round turret or

tower of clay about three feet high, and surmounted by a conical roof which projects a few inches over the sides of the upright part like the eaves of house.

The ants never enlarge or alter one of these turrets after it is completed. If too small for the family, they build another a few inches distant. Sometimes five or six of these dwellings may be seen in a group. They are so strongly and compactly made that they will sooner tear up the earth upon which they are built than break in the middle. But if, by any accident, one should become broken, the ants do not abandon it, but use the overturned tower as the base for a new structure.

The interior of these singular houses is divided into a great number of irregularly shaped cells, to each of which there are at least two entrances, but we find none of the intricate galleries, arches, and passage-ways, that are so remarkable in other species.

While describing the white ants, we must not forget the "soldiers." Is it not singular that ants should keep a standing army similar to the

armies maintained for the support of human governments? These soldier-ants compose such a force, and their duties are such as are required of men in military service. They keep guard over the royal cell, and over those laborers who are too busily engaged to attend to their personal safety. They also defend the city, and are always on the alert for the approach of enemies.



The Soldier-Ant

If the citadel is threatened with an attack from some hostile tribe, the alarm is quickly spread, and the whole community is soon engaged in self-defense. If the assailants make a breach in the outer walls, the laborers are exposed to full view and to imminent danger; but

as they can not fight, they at once retire within the inner walls, and give the alarm to their companions. A few soldiers carefully reconnoiter the field, evidently attempting to ascertain the numbers and position of the attacking party. Having determined upon the force necessary to resist the assault, or to repair damages already done, they return to the inner part of the citadel for a moment, and quickly appear with their comrades. The alarm soon becomes general; the little soldiers appear greatly enraged, and take vengeance upon every unfortunate enemy that comes within their reach. It is supposed by some writers that they are blind, and many of their actions indicate that such is the fact. They move their heads about very rapidly as if anxious to seize some enemy, and stretch out their long, pointed jaws to the utmost, ready to fasten upon the first unfortunate foe that comes near. So fiercely do they seize upon their antagonists that they often part with their life before relinquishing their hold. Sometimes a stick has been held out to one of these spirited soldiers, and he has fastened upon it so firmly

that the jaws could not be disengaged without killing the insect.

As soon as peace and quiet are restored, the soldiers retire. Their place is then filled by laborers who crowd the breach, each carrying in her mouth a load of mortar half as large as her body. This is properly placed, and the little worker hastens back for more. An observer says, —

“Not the tenth part of an inch is left without laborers working upon it at the same moment; crowds are hurrying to and fro; yet, amid all this activity, we observed the greatest order. No one impeded another, but each seemed to thread the mazes of the multitude without trouble or inconvenience.”

Meanwhile, the soldiers act as sentinels, walking in and out of the opening, with closed jaws and determined manner. At short intervals of a minute or two, a soldier makes a peculiar noise by lifting up his head and striking his jaws against the wall of the dwelling, and immediately all the laborers, appearing to regard it as a signal for greater diligence or dispatch,

answer by a loud hiss and by prompt obedience.

There is another species of white ant which builds a spherical or oval nest on the exterior of trees, sometimes at a height of seventy or eighty feet from the ground, and varying from the size of a hat to that of a barrel. These nests are built of small bits or gnawings of wood kneaded into a paste with a glue, probably secreted by the ants in a manner similar to that in which bees secrete their wax. The ants attach these nests very firmly to the trees, and the wildest tornadoes fail to shake them off. Sometimes this species, instead of selecting the bough of a tree, build their nests in the roof or walls of a house, and unless discovered in season cause great trouble. It is much easier to prevent their entrance than to expel them after they have once gained a foothold.

Let us not pass over this fact without finding a useful lesson. It is much easier to abstain from bad habits than to get rid of them when once formed. Solomon understood this principle when he said, "leave off contention before it be

meddled with." Applying this rule of action to every-day life, we should shun all that is evil, and take care that sin finds no lodging-place in our hearts. But as sin is always present with us; our constant prayer should be, "Create in me a clean heart, O God, and renew a right spirit within me."

CHAPTER V.

Diligence of Ants. — Number of Ants. — Nothing made in vain. — Caution in forming opinions. — Ants used for Food. — Enemies of Ants. — The Ground Hog. — The Great Ant-Eater. — The Little Ant-Eater. — God's love manifested in all his works.

ALLUSION has been made to the diligence of ants, and the rapidity with which they perform their work. These traits are exhibited in a striking manner in the quickness with which they repair damages made in their dwellings. A gallery, or passage-way, three or four yards in length, has been restored in a single night. If indeed a nest should be divided in halves, only leaving the royal chamber unharmed, — thus laying open thousands of apartments, — all would be closed up with walls of clay by the next morning. Even if the whole nest should be demolished, provided the royal family was left undisturbed, every opening between the ruins, at which cold or wet could possibly enter,

would be covered, and in an incredibly short time, considering the size of the little workers, the building would be raised to nearly its original dimensions and grandeur.

We often hear and read of inconceivable multitudes of ants, and perhaps have complained of them as a useless nuisance. But God makes nothing in vain, and we may rest satisfied that he has not created one ant too many. All our investigations into his works show us his goodness, and reveal new sources of wonder and gratitude. How often do we see a kind Providence, and a father's hand, in some event which at first seemed dark and mysterious. Experience thus warns us not to distrust God or complain of Him. A little reflection upon the vast number of ants, especially in tropical climates, will convince us that they must be of great use in consuming matter which otherwise would produce disease and death. They thus become promoters of health, and a blessing, instead of a nuisance, as they are too apt to be considered.

White ants are often used for food. In some parts of the East Indies the natives work them

up with flour, and make a variety of pastry which they sell at a low price to the poor. The Africans, too, parch them over the fire, and consider them delicious food. A traveler, to whom the world is indebted for much of its knowledge of the white ants, says he has eaten them prepared in this way, and thinks them delicate, wholesome, and nourishing.



The Maned Ant-Eater.

There are several kinds of animals peculiar to

different countries which are the deadly enemies of ants, but they are all known under the general name of ant-eaters. Their most remarkable characteristic is a long and flexible tongue which serves as a hand for carrying food to the mouth. When protruded to its fullest extent, it has some resemblance to a large red earth-worm, and coils and twists about as if it possessed a separate life of its own.

Among the ant-eaters especially worthy of notice, is the Ground Hog, a native of Southern Africa. This animal is about five feet in length, has a long, pointed nose, and stiff, erect ears. Its body is well proportioned, of a reddish-brown color, and armed with bristles. Its greatest strength is in its fore-legs, the feet of which are furnished with sharp claws with which it opens the dwellings of the ants, and also digs burrows for its own habitation. It is seldom seen in the day-time, but at night leaves its home, and makes its way to an ant-hill. Laying hold of the earthen walls, it speedily tears them down, and as the terrified inmates rush out in swarms, sweeps them into its mouth by hundreds.

There is another animal, called by way of distinction, the Great Ant-Eater, or Tamanoir. This is a native of South America. Its body is from four to five feet in length, having a tail covered with long, bristly hair, which the Indians use for various kinds of ingenious wicker-work. The fore-feet are armed with claws, which serve the double purpose of scratching up the ant-hills, and of taking strong hold of any object. While sleeping, it is said to closely resemble a rough bundle of hay thrown loosely upon the ground, for the hair is so long and coarse as scarcely to be recognized as the coat of an animal. Although a slow and unwieldy animal, nature has not left him defenceless. If an enemy approaches too closely, he grasps the intruder within his claws, and, like the bear, squeezes him to death.

A still more curious animal is the Little Ant-Eater, which generally lives in the trees, clinging to the limbs, and swinging from them by its tail, which is sufficiently strong to support the whole weight of the body. It is a bold creature, attacking, not only the nests of ants, but also those of wasps, putting its paw into the combs, and drag-

ging the grubs from their cells. Like its larger relatives, it is active only at night. During the day it sleeps with its tail safely twisted around the branch on which it sits.

These animals prevent too great an increase of the ants, while at the same time they are not so numerous as to exterminate the race, or to interfere with the useful labor which the Creator has evidently committed to the little insects to perform.

Thus have we traced the life of the ant. We can say with the poet:—

‘Thou little insect, infinitely small,
What curious texture marks thy tiny frame!
How seeming large thy foresight, and withal,
Thy laboring talents not unworthy fame,
To raise such monstrous hills along the plain,
Larger than mountains when compared with thee;
To drag the crumbs dropp’d by the village swain,
Huge size to thine, is strange indeed to me!
But that great instinct which foretells the cold,
And bids to guard ’gainst winter’s wasteful power;
Endues this mite with cheerfulness to hold
Its toiling labors through the sultry hour;
So that same soothing Power, in misery,
Cheers the poor pilgrim to eternity.”

We have seen how God cares for the little insect in all its wants, and have found additional evidence that nothing is too small to escape the notice of the Creator; that his tender mercies are over *all* his works. The Psalmist says:—
“Whoso is wise, and will observe these things, even they shall understand the loving-kindness of God.” If God is careful of the least of his creatures, shall we not believe that “his merciful kindness is great toward us?” Especially let it be remembered, that “he gave his only begotten Son, that whosoever believeth in him should not perish, but have everlasting life;” and let our study of Nature and its wonders lead us to give our hearts to him who is not only the God of Nature but the God of Grace!

THE FLY.

“Divers sorts of Flies.”

THE FLY.



CHAPTER I.

Always something to be learned. — Different species of Flies. — Diptera. — Transformations of the Fly. — Structure of the Fly. — How a Fly eats and drinks. — How a Fly walks. — Different theories. — Our ignorance of familiar things. — A Fly on the wing. — Its rapid flight. — How does a Fly buzz. — Where do Flies go in the winter. — Wordsworth's lines to a Fly. — Kindness to those in Trouble. — Usefulness of the Fly. — Blessings in seeming ills.

HOWEVER familiar a subject may be to us, we can always, by careful study, learn something new concerning it. It is one evidence of the infinite power of the Creator that we can never exhaust his works, and thus we have the highest incentive to take the position of learners. Flies are common objects, which the reader may think very uninteresting. But God has made

every thing for some good purpose; He has created nothing that is not well worthy of our study. The Bible and the book of Nature, so far as we can read them, teach us these truths. The little fly which buzzes upon the window-pane, or sits upon the edge of the sugar-bowl and unwittingly steals the sweet food, may, if we think aright, become a teacher, and we shall learn that from the seeming ills of life we can derive much that is pleasant and often useful.

Sir William Davenant, in remarking upon the works of God, says, —

“To study God, God’s student, man, was made;
To read him as in Nature’s book conveyed,
Not as in Heaven.

Each little flower,
And lesser fly, shows his familiar power.”

Another poet, in speaking of the wisdom and skill of the Creator, as manifest in what we inaptly call the lower orders of creation, says, —

“’Tis sweet to muse upon the skill displayed; —
Infinite skill in all that He hath made;
And trace in Nature’s most minute design
The signature and stamp of power divine;

Contrivance infinite expressed with ease,
Where unassisted sight no beauty sees ;
The shapely limb, the lubricated joint,
Within the small dimensions of a point,
Muscle and nerve miraculously spun,
His mighty work who speaks,—and it is done.”

There are a great many species of flies, but they are nearly all classed under the general name *diptera*, meaning *two winged*, and possess the same general characteristics : two pairs of wings, two balancers, or poisers, just behind the wings, and a horny or fleshy proboscis formed for sucking or lapping food. The many transformations through which flies pass in their short lives attracted the attention of the earliest naturalists, and present the most curious circumstances in their history. There are four distinct stages of their existence : that of the egg ; the larva, or caterpillar ; the pupa, or chrysalis ; and the perfect fly.

The larvæ, commonly called maggots, have no feet. The pupæ are either incased in the dried skins of the larvæ, or are partially exposed, with their wings and legs free and unconfined.

The head is large and globular, joined to the body by a very slender neck, and is capable of rapid and varied motion. The greater portion of it, especially in the males, is occupied by the brilliant compound eyes. In some instances we find single ocelli, or little eyes, which are always situated on the top of the head. The proboscis is placed under the head, and by some varieties of flies is often drawn up and concealed in the mouth. This organ so indispensable to the existence of the fly, consists of a long channel ending in two fleshy lips, enclosing on its upper side several fine bristles as sharp as needles. The wounds or bites which the fly inflicts are made by these sharp-pointed instruments, and the saliva that flows into them causes that painful swelling and itching which is so common that it need not be described! The wings are filmy or gauze-like, and are abundantly supplied with veins. If the reader has a microscope or magnifying glass he can examine a wing at leisure, and see and admire its beautiful structure. The delicate threads, invisible to the naked eye, compose a net-work of marvelous

beauty, and the mind is filled with astonishment that such creative skill should be displayed upon so small an object, where the natural eye of man never would have detected it. Just behind the joints of the wings are two little convex scales, which open and shut with every movement of the wings. These are sometimes called winglets. Immediately behind these are the balancers, or poisers, already alluded to, which resemble short threads knotted at the ends.

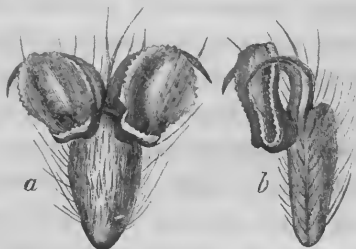
The fly's sole instrument for eating and drinking is his proboscis. It is evident that this must be a convenient article when inserted into any liquid, or applied to the broken surface of over-ripe fruit; but we often see flies busy upon lumps of hard white sugar, which are evidently as grateful to them as to ourselves. How, without teeth, does the insect demolish this crystal mass? A magnifying glass reveals the mystery. The fly dissolves the sugar by a salivary fluid which passes down through the same pipe which shortly after returns the sugar melted into sirup.

The diptera have six legs, and each foot has two claws and two or three little cushions or

pads set with numerous hairs, spreading out so as to constitute little cups.

It is well known that flies and many other insects possess the power of creeping up smooth perpendicular surfaces, and of walking upon the ceiling with the back downward. When you see a fly thus walking, the inquiry immediately arises in the mind, How is it done? This question has not yet been fully settled. Many writers have attempted to explain the wonderful fact, and many diverse opinions have been advanced. Some say that the secret is in what, when boys, we called "suckers," on the bottoms of the feet. In other words, it is said that a vacuum is produced by certain organs attached to the ends of the feet, which thus adhere to any object by the outside pressure of the atmosphere, or are left free to rise as these "suckers," are alternately expanded or contracted. This has been, and perhaps now is, the commonly received opinion, and it may be the correct one, although modern science has advanced a different theory. A believer in the method already stated explains his ideas in the following manner. He says, "The feet are pro-

vided with suckers, very beautifully and wondrously contrived, which may be seen by looking through a microscope at a fly walking along the opposite side of any clear glass.



Foot of the Blue-bottle Fly magnified.

The engraving shows (a) the under side of the last joint of the toe, with the suckers expanded, as when the insect is walking on a pane of glass. There is also a side view of the same part (b). The view shows the foot magnified six thousand four hundred times.

Two of these suckers are united to the last joint of the toe, immediately under the root of the claw. They spread out from a single root, which is able to move in every direction. When these suckers are applied to any substance, they are separated from each other, the surface of each being widely expanded, but when disengaged they become nearly closed, and are brought

together so as to be confined within the space between the two claws. The outer edge of each sucker is beautifully toothed like a saw, and the surface, which is concave, is rough, with little points.

It is not certain, however, that this theory of inverted locomotion is the true one. It is said by others, that the little pedestrian can traverse the sides and stick fast to the dome, of an exhausted receiver. Here, certainly, is no atmospheric pressure. The gentleman who tried this experiment, found that a fly, benumbed with cold, or enfeebled from some other cause, met with difficulty in climbing a glass ascended before with perfect ease. He also observed that flies unable to stand, back downward, on highly polished bodies, were able to do so on those slightly soiled. From these facts he concluded that the apparatus by which they secure their position, is purely mechanical, and corresponds to the fine hair-brushes which other insects use as holders or supporters.

Several students of insect life have maintained that the adhesion of flies to smooth surfaces, and their ability to walk in any and every conceivable

position of the body, are due to glutinous liquid secreted in the bottoms of the feet. Nearly two hundred years ago, an old writer remarked, "The fly is provided with six legs and walks on four. The two foremost she uses as hands wherewith to wipe her mouth and nose, and take up what she eats; her other feet are cloven, and armed with little claws, by which she fastens on the rough and sharp places of all bodies like a catamount. She is also furnished with a kind of fuzzy substance, like little sponges, (the same that we have called "suckers,") with which nature hath lined the soles of her feet, which substance is also filled with a white, sticky liquid, squeezed out at pleasure to glue herself to the surface."

Mr. White, in his "Natural History of Selborne," observes that toward the close of the year, when flies crowd the windows in a sluggish and torpid condition, they are hardly able to lift their legs, and that many are actually glued to the glass, and there die from inability to overcome the pressure of the atmosphere.

The faculty of walking upon smooth surfaces, and in any position of the body, is not limited to

insects. Some species of lizards possess a similar faculty, and a similar apparatus to account for it. There is one reflection which naturally suggests itself at this point, — how easy it is for us to show our ignorance upon subjects which seem so very familiar! The fly is the common summer companion of man. We are compelled to give it shelter and food, and we can not drive it from our homes; we think we are acquainted with its every motion; learned men have studied its characteristics and habits with great care, and still we can not tell how a fly walks! Is not man's wisdom folly with God, and if we thus stumble and fail before one of the least of God's works, shall we expect to understand all the mysteries of his kingdom? There is a limit to man's knowledge; there is something always beyond and above his reach; the finite loses itself in the infinite. Here is one grand proof of a Supreme Being, — that we discover a controlling mind greater than man's, manifestations of power beyond his comprehension. Let us be thankful for this, — thankful that we can not understand all things; for as an acute thinker remarks, "a God under-

stood is no God at all ; ” — thankful, too, that we can know and comprehend all that is necessary for our present and eternal happiness. Here there is no doubt. Christ is the way, the truth, and the life, and if any man believe on him, he shall not perish, but shall have everlasting life.

A fly on the wing is no less interesting than when on foot, and yet how seldom do we trouble ourselves to think about it, except as an insect that annoys us. The flight of the insect tribes is wonderfully rapid, and is also remarkable for its variety of direction. The fly proceeds, generally, in a direct line, with its back upward, like a bird, but oftentimes in a contrary direction with its back downward, as when starting from a ceiling and alighting on the wall of a room. It has been calculated that the common house-fly makes with its wings not far from six hundred strokes every second, by which it is carried five feet. It is also stated, that if alarmed, its speed can be increased six or seven fold. A fly is so small an animal that we do not realize the swiftness with which it moves from place to place. Kirby remarks that if the insect equaled the race-horse in size, and

retained its present powers in the ratio of its magnitude, it would traverse the globe with the rapidity of lightning. A principal agent in its flight is the air, which passes from the breathing organs of the body into the nerves and muscles of the wings. In consequence of this arrangement, the velocity of the swift-winged traveler depends not alone upon muscular power, but also upon the condition of the atmosphere.

We found it difficult to answer the question, — How does a fly walk? There is another equally hard of solution, — How does a fly buzz? Does one reader quickly respond, “With its wings?” or another with a laudable attempt at a philosophical answer, reply, “With its wings as they vibrate upon the air?” Of these readers who have solved the problem so readily, we will ask other questions. If these answers are correct, how is it that the great Dragon-fly, and other similar broad-winged, rapid flying insects, move through the air with silent swiftness? And why do other species keep up their buzzing when not upon the wing? What response can be made to these inquiries? The buzzing of a fly is a more

perplexing problem than the walking. Rennie, one of the most thorough students of insect life, attributes the sound partly to air, but to air as it plays "upon the edges of the wings at their origin, as with an *Æolian* harp-string, or to the friction of some internal organ on the roots of the wings, nervures, or ribs."

There is yet another question concerning flies difficult to answer, — Whither do they go on the approach of winter? Naturalists have thus far failed to solve this mystery satisfactorily. Doubtless a great proportion perish from cold, and the many accidents to which their weakness and growing torpor render them more and more exposed as the year declines. Yet, in comparison with the countless swarms that beset us in the warm summer months, and blacken the ceiling with backs downward, how few do we ever perceive stiff and dead on the floor. We all know that some flies do survive the cold months, for on a mild winter day we often see them emerging from unknown places, and sometimes solitary, large, fat flies, will crawl out upon the window-seat or mantel, tempted by the warmth of the fire from their

hiding-places. Under such forlorn circumstances, a fly becomes to us an object of interest. Our dislike of the buzzing, tickling, troublesome insect of the summer, is changed to sympathy for the forlorn, shivering, mateless creature, tempted by deceptive warmth to quit his winter asylum. We do not deny the insect the bits of food he picks up, and we would even save him from drowning in an ocean of milk, or from being swallowed up in a swamp of honey.

Did you ever set such a fly, damp and dripping, on the heated mantle-piece, and watch his gradual restoration to life? If not, then try it when the next opportunity presents itself. See how at first languidly, and then more briskly he uses his handy paws, stroking and wiping his head and face, and large moveless eyes, and then notice him with his hinder limbs performing the same operations on his wings and body. Sympathy will be aroused for the weak insect, and you will learn the pleasant lesson that the sufferings of the meanest creature, when in adversity, strike a tender chord in our hearts.

A forlorn fly was tempted on a very cold day

to the warm stove of Wordsworth, who tells the incident in a poem. After contrasting his own warm comforts and loving companionship, with the shivering and solitary condition of the fly, he says, —

“Yet God is my witness,—thou small helpless thing,
Thy life I would gladly sustain,
Till Summer comes back from the South, and with
crowds
Of thy brethren, a march thou should'st sound through
the clouds,
And back to the forests again.”

But while thankful that our hearts so often respond in sympathy, for the adversities and afflictions of others, we should not forget that the Lord careth for us in our troubles, and if he chastises us, it is only that he may afterward bless us the more. And we should remember that although “no chastening for the present seemeth to be joyous, but grievous; nevertheless, afterward it yieldeth the peaceable fruit of righteousness unto them which are exercised thereby.”

It has been already remarked that God created every thing for some wise purpose. The reader

will remember that in the history of the ant we learned our great indebtedness to that insect for removing impurities from the earth. We owe a similar if not a greater debt of gratitude to the fly. Its labors in this respect are much more important than we are accustomed to think. The wheels of the intricate machinery of nature, which otherwise would be continually clogged and impeded by impurities of every description, are kept comparatively clean and in good order, by the labors of insects, which, like the exertions of other agents performed for their own little ends, are made by the Ruler of all things conducive to a grand result. The fly is, in fact, a scavenger of no small ability, and while it is the source of great annoyance, it may be questioned whether its good services do not more than balance its evil deeds.

A modern author says, "The fly's purpose in Nature is to consume various substances which are given out by the human body, by articles of food, and almost every animal and vegetable production when in a state of change, and given out in such small quantities that they are not

perceptible to common observers, neither removable by the ordinary means of cleanliness, even in the best kept apartment." If this be so, shall we not submit to its annoying habits with more patience?

How often does it occur that things which at first seem useless and even hurtful, afterward prove themselves to be of great value to us, and minister to our comfort and happiness in a thousand different ways. So often is this the case, that we should learn to be very cautious in forming our judgments, not only concerning things of the natural world, but respecting our fellow-beings in their different relations. It is much better to come slowly to a just conclusion, than to form rash opinions which must afterward be changed, and perhaps not until great injustice has been done.

CHAPTER II.

The House-fly. — Its origin. — Its cleanliness. — A social insect. — A terror to housekeepers. — Fly poisons. — The Crane Fly. — Its singular egg-placer. — The Nemestrina. — Its remarkable beak. — The Blow Fly. — Its usefulness. — The May Fly. — Its transformations. — Rennie's observations. — Useful lessons. — The Spanish Fly. — Its medicinal qualities. — Species in this country. — The Potato Fly. — The Fire-fly. — Its beauty; the Poet Southey. — Fire-flies in the tropics. — Early superstitions. — The Saw-fly. — Its saws. — How it lays its eggs. — The Dragon Fly. — Its beauty and cruelty. — Its transformations. — The resurrection.

HAVING thus described the general characteristics of the fly, let us now turn our attention to the peculiarities of some of the different species.

THE HOUSE-FLY.

The common house-fly will naturally claim our first attention. We all know how much at home the domestic flies make themselves in our

houses, upon our persons, upon our food, and in every warm and sunny spot that they can find, and how they buzz about as if always contented and happy. The hovel and the palace, tin cups and silver plate, decaying meat and dainty preserves, the side-board and the cheek of a child,—all seem equally attractive to these insects, and they swarm about us neither restrained by fear, nor discouraged by opposition. But whence did they come? Let not the reader be surprised to learn that their parents made themselves as much at home, and were as happy in the stable near by, as the children who from the stable have found their way to the house. There, among the horses and cattle, the greater proportion of the insect-mothers found a hot-bed for their eggs, and ample provision for the in-



Eggs of the Domestic Fly.

fant race. There the flies were born, and in this humble birth-place, and when in their first

and wingless state of maggots or larvæ they commence their important mission of helping to rid the earth of all things that offend. Thus we see that even in their infancy, the flies which we so much despise begin their life of usefulness.

But the stable is not the only birth-place of house-flies,—the roads and the meadows furnish great numbers of these familiar creatures. But although bred in filth, and living often in unclean places, the fly takes apparent delight in brushing off all dust and dirt by rubbing its feet together, and it carefully cleans its head, face, eyes, wings, and body with its fore and hind legs. This process very much resembles that used by cats for the same purpose, and the reader has doubtless often noticed flies thus employed.

Flies begin to appear in houses in July, and sometimes even earlier than this, and by August, are very abundant. They do not disappear until cold weather. The swarms of summer are doubtless the progeny of a few individuals who have survived the winter months in some pro-

tected nook, and it is possible, too, that many are born from eggs laid the preceding season. The house-fly is such a constant companion of man, that its presence, even on some desolate island, is sufficient proof that human beings are not, or have not been, far distant. Like the bee, it is a social insect, and compels us to an intimate acquaintance, whether we are willing or not.

It can not be denied that the house-fly is a troublesome insect, and a terror to tidy house-keepers. Some foreign writers have charged us as a nation with carelessness in regard to flies, and perhaps with some reason. We are well aware that they seem to swarm in some houses, covering every article of food by day, and blackening the walls by night (for flies are quiet in the dark); while other houses are comparatively free from them. If food of any kind is left standing uncovered, it will quickly attract them, and the good news rapidly spreads throughout the whole fly community. Thorough neatness is the best preventive against these unwelcome swarms, but it is not a certain one, and it

is well to make a business of driving the intruders from the house once a day. Various methods have been tried to exclude flies from houses, or to kill them after they have secured an entrance, and taken possession. We can imagine how the little unsuspecting insect would shudder if it but knew the many ways the ingenuity of man has planned for its destruction. One of the simplest, and at the same time, most effectual methods of destroying flies is to place a dish of strong green tea, well sweetened, in an outer apartment accessible to them. They will taste of it, and the effect will be as fatal as that of any approved poison.

THE CRANE FLY.

This species is common in meadows. It is especially remarkable for its singular organ for laying its eggs. This egg-placer is beautifully constructed, serving first to bore the earth, and then, as it is tubular, to allow the eggs to pass to the spot where the caterpillars, when hatched, will find the food they need. A gentleman observed one of these flies make a hole in the

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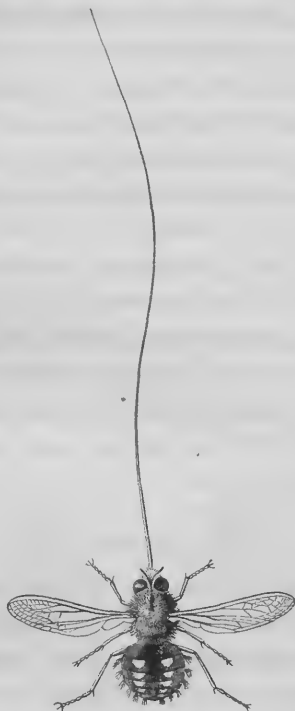
ground for its eggs. She had chosen a bank sloping toward the south, and bare of grass. She stood, with her legs stretched out on each side, and kept turning herself half round, backward and forward alternately. By this motion the egg-placer of the fly made its way into the hard soil, and through the singularly contrived tube she deposited her eggs in a secure situation. The eggs, however, were not all placed in the same hole. Every few moments the fly changed her place, but never more than an inch from where she bored last. While thus engaged, her male companion was seen suspended by one of his legs on a twig not far from her, apparently either watching her movements, or on the look-out for intruders or enemies.

THE NEMESTRINA.

A long-beaked fly, next attracts our notice from that feature which gives it its name.

The Creator always adapts his creatures to the conditions in which he places them. The peculiar wants of different animals have their peculiar means of gratification, and every ani-

mal is perfect of its kind and fitted in all respects for its own existence. In the whole



The Long-Beaked Fly.

animate creation no superfluous organs are found

and no necessary ones wanting. The long-beaked fly has an extraordinary trunk, with which it collects the pieces that constitute its food. The reader will note the length of the beak as compared with that of the body of the insect. If we can not fully understand its uses, we can appreciate its strange appearance, and wonder at the infinite variety in the works of creation.

THE BLOW FLY.

This species, in common with a few others, instead of laying its eggs like the majority of insects, hatches them in its own body, and



Magnified Blow Flies ; one newly hatched.

deposits little footless, but living, caterpillars upon decaying animal matter, and these infant flies

commence their eating as soon as they touch the substance upon which they have been dropped.

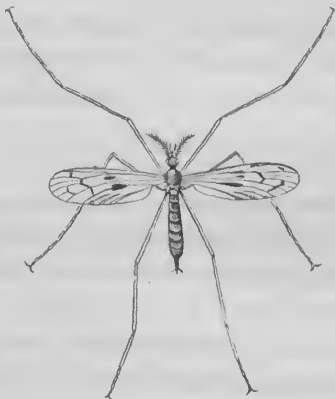
It has been supposed that this peculiarity is in consequence of their being appointed to assist in cleansing the surface of the earth from dead and putrefying animal matter. For this purpose it is necessary that no time be lost in quickly developing the laborers to an active existence that they may undertake their task. It seems also needful that their number shall be in proportion to the amount of work to be done. These ends are, therefore, secured by extraordinary means.

It has been ascertained that one of these flies will produce twenty thousand young, and that these attain their full growth in a fortnight, and then produce others.

THE MAY FLY.

This insect is classed under the general name of *ephemera*, a Greek word, meaning "for a day." The propriety of this name arises from the fact that it lives but a single day in its perfect state.

The Ephemerae pass through several transformations. In their early stages, they either live in holes in the banks of rivers, or of brooks, which are so situated that the water enters them. They seldom leave these nests, but when they do, they swim about, walk on the bed of the stream, or conceal themselves under stones or pieces of wood. It is said that some ephem-



The May Fly.

erae live one, others two, and some even three years in this manner; but at last having burst

their pupa skins, they leave the water, and are perfect flies for a day.

Although the various species attain their perfection at different times of the year, the same species appear regularly at about the same period. During a few days at this season, they fill the air in the neighborhood of rivers. One species, remarkable for the whiteness of its wings, sometimes rises and falls in such numbers on the banks as to thicken the air and whiten the surface of the ground, reminding us amid the verdant and leafy summer, of

“The flaky weight of Nature’s purest snows.”

The celebrated naturalist Reaumur, having been informed by a fisherman that the may-flies had appeared, got into his boat about three hours before sunset, and detached from the banks of the river several masses of earth chrysalides, which he put in a large tub filled with water. He remained in the boat until nearly eight o’clock, and seeing nothing remarkable in the number of the flies, and being threatened with a storm, he gave orders for the tub to be landed, and placed in his

garden, at the foot of which ran the river Marne. But before his directions could be obeyed, an astonishing number of ephemeræ came forth. Every piece of earth that was above the surface of the water was covered by them, some beginning to quit the chrysalis, others prepared to fly, and others already on the wing. Under the water, too, they were every-where to be seen, in a more or less advanced state.

The storm coming on he was obliged to retire ; but when the rain ceased to fall he returned. The tub had been covered with a cloth, and as soon as it was removed, the number of flies appeared to be much greater, and kept continually increasing. Many flew away, but many more were drowned. Those already changed, or changing, would, of themselves, have been enough to make the tub seem full ; but others, attracted by the light very much enlarged the number. To prevent their being drowned, Reaumur caused the tub again to be covered with the cloth, and over it he held the light, which was soon concealed by a layer of these flies which might have been taken by hundreds from the candlestick.

It may seem strange that a being perfect and beautiful in all its parts should be created for so brief an existence, and we may say, what is the use, or of what worth is so short a life? But we must not question the wisdom of an infinite God with whom a day is as a thousand years, and a thousand years as one day. We should also remember that while the infancy, middle age, and old age of a perfect May Fly, are all comprehended in less than the compass of a day, yet in its different stages of existence, it has lived for two or three years.

In the life of the May Fly there are lessons for us written in characters divine. How much precious time made up of stray minutes and half-hours we daily throw away because we think it is not worth while to use them! How many important efforts do we shrink from making because life may be too short for their completion! How much time we throw away because we can not expect to reap the fruit of our labors, forgetting that we are sowing not for time but for eternity. In all these things, an ephemeral fly may teach us wisdom. Although a few summer

hours constitute all its existence, not a moment is wasted. It lives a life of ceaseless activity and enjoyment, and although it dies so soon, it has well performed the purpose of its creation.

THE SPANISH FLY.

It will be difficult to find any pleasing associations connected with this insect. The very name is suggestive of the sick-room, physicians, and painful blisters. But while in this respect the fly has doubtless been of great use, it is gratifying to know that we depend much less upon it than formerly. What insect has caused so much pain in the world, and that too when dead? Yet it may be said that, in compensation for all this suffering, it has relieved pain and saved life.

Cantharides, or Spanish flies, are found in the south of Europe, and especially in Spain and Italy, where they are collected in great quantities for exportation. They often appear in immense swarms upon the trees in May and June, so that the limbs actually bend beneath their weight, and are stripped of all their foliage. They are very timid, and when alarmed, they

draw up their legs and feign death. They possess the power of raising blisters when applied to the skin, and retain it when dead and dry. It is this property that renders them so valuable as medicinal agents.

They are collected in the early morning, when they are in a torpid state, and will easily let go their hold. The gatherers, protected by masks and gloves, beat the trees, and the flies fall upon a cloth spread to receive them. They are then deprived of life by being exposed to the steam of hot vinegar.

Some species of *Cantharides* are found in this country, and are very destructive to foliage. Of these the "potato-fly" is very common in New England; — another species seems especially fond of the clematis, and still another of the leaves of the bean. These native insects are sometimes collected for medicinal purposes, but the Spanish fly is the species most generally known to the profession, and most active in its desired work.

THE FIRE-FLY.

Did you ever notice, in passing through a

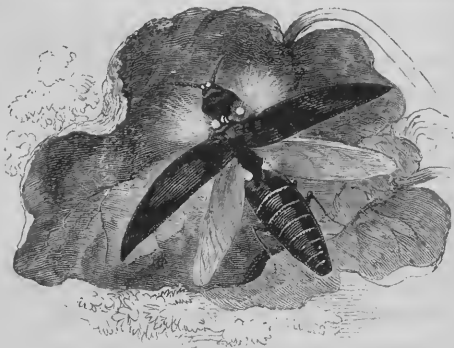
swamp or lowland on a summer evening, the flashing, brilliant fire-flies, making the landscape seem as if illumined by a thousand swinging miniature lamps? It is one of the most beautiful sights upon which the eye can rest. Although these luminous insects abound both in Europe and America, they are found in greatest perfection in the tropical climates. It is in the home of the humming-bird, — that winged gem whose luster seems borrowed from a tropical sun, — that we are to seek for the insect lamps of night in their greatest perfection.

Many a traveler in the forests and mountains of the West Indies has been shown on his way by these flies, on nights when the light was insufficient to disclose the dangers. The poet Southey says, —

“Innumerable tribes

From the wood-cover swarmed, and darkness made
Their beauties visible; awhile they streamed
A bright blue radiance upon flowers that closed
Their gorgeous colors from the eye of day;
Then, motionless and dark, eluded search,
Self-shrouded; and anon, starring the sky,
Roll like a shower of fire.”

The fire-fly of St. Domingo and the West India Islands is about an inch in length, and one third of an inch in breadth. It gives out its principal light from two transparent eye-like tubercles, placed upon the chest. There are also two luminous patches concealed under the horny wing-cases, which are not visible except when the insect is flying, when it appears adorned with four brilliant gems of the most beautiful golden blue luster. In fact, the whole body is full of light



The Fire-Fly.

which shines out between the abdominal segments, when separated.

We are told that the natives were formerly accustomed to employ these living lamps which they called cucujos, instead of candles, in their evening household occupations. In traveling at night, they were accustomed to tie one to each great toe, and in fishing and hunting required no other light. Besides this, they were sought for, and encouraged in houses, and especially sleeping-rooms, as extirpators of gnats, which constitute a great part of their food.

The fire-fly is common in the inter-tropical regions of the American continent, as well as the West Indies. Several allied species are also luminous. But of all, the lantern-fly of South America is said to be preëminently brilliant.

The light of these tropical flies is often so intense as to cast the shadow of any object on the opposite wall in a dark room. The under-side of the throat seems, as it were, red-hot. When left to itself, the insect becomes quiet, and the light fades to a mere speck.

Formerly, these flies were regarded with superstition, their light being supposed to be that of malignant spirits. But we now look upon the

brilliant flashes as the beautiful radiation of an insect sporting among its inoffensive companions.

THE SAW-FLY.

A most singular egg-placer in the body of a little four-winged creature, has obtained for it the name of the "saw-fly." The female is provided with saws which are lodged in a deep chink under the hinder part of the body, like the blade of a knife in its handle, and are covered by two scabbard-like pieces. The saws are two in number, placed side by side, with their ends directed backward, and are so hinged to the under side of the body that they can be withdrawn from the chink and moved up and down when in use. They vary in form and in the shape of the teeth in different species of saw-flies; but they generally curve upward, and taper toward the end, and are toothed along the lower or convex edge. Each saw has a back to steady it, like a carpenter's fine saw, but the blade is not fastened to it, but slides backward and forward upon it. It is also covered on one side with cross rows of very fine teeth, which

give it the power of a rasp as well as that of a saw.



Saw of the Saw-Fly.

The female saw-flies use these ingeniously-contrived tools to cut little slits in the stems and leaves of plants in which they afterward drop their eggs. The grubs, which often strip rose, gooseberry, raspberry, and red-currant trees of their leaves, and invade the birch, alder, and willow, may be known by having from sixteen to twenty-eight feet, by which they usually hang to the leaf they feed on, while the hinder part of the body is coiled up like a watch-spring. Some of the most common of the perfect flies have a flat body of a green or orange color, with black head and shoulders.

In the fine summer mornings, the females of the rose saw-fly may be seen eagerly traversing the branches of a shrub one after another. Usually resting on the twig nearest to the end

of the principal stem, the insect makes an opening with her saw, and when the hole is of a proper size, deposits an egg in the cavity.

She then remains quiet for a few moments, draws away the greater part of her egg-placer, and at the same time emits a frothy fluid. This rises as high as the outer edges of the opening, and often higher. She now proceeds to make another hole, and then another, sometimes producing only four in a line, but generally twenty. The part of the branch so notched in many places shows nothing remarkable on the first day, but on the second it begins to assume a brown color. At last, all the wounds become raised and round in form. This growth is owing to the increased size of each egg, which daily becomes larger, and forces the skin of the branch upward. The little caterpillar, on coming out of the egg, feeds upon the leaves of the shrub on which it has its infant home. There are a great many species of the saw-fly, and over sixty have been catalogued as natives of this country.

THE DRAGON FLY.

This insect is distinguished for its brilliant and beautiful colors, and the ease and grace with which it flies through the air. It has four large, shining, delicate wings of nearly equal size, and a mouth very well adapted for crushing its food. On account of the lightness and beauty of these flies, the French call them *demoiselles*. Kirby speaks of their dress as "silky, brilliant, and variegated, and trimmed with the finest lace;" and another naturalist says, "they set forth Nature's elegance beyond the expression of art."



The Dragon Fly

But kind and generous qualities, and a good heart, are not always found beneath a beautiful

exterior. We can not judge correctly from external appearances, for it is often true, that "things are not what they seem." The character of the dragon fly is in strong contrast to its gay and elegant attire. It is one of the most cruel and voracious of insects, darting with the swiftness and fierceness of a hawk upon gnats, musquitos, butterflies, and almost any soft-bodied winged creature, and oftentimes devours even those of its own species. But it never injures man, attacking neither his person, cattle, or crops; on the contrary, it may be justly considered of great use in destroying noxious insects.

Thus shall we ever find in our intercourse with our fellow-men, that no one is so utterly degraded, or wicked, but that there is some good trait to be found, covered though it may be with sin.

Dragon flies pass their earlier states beneath the water. The caterpillars and chrysalides are, in form, somewhat like the perfect insect, and breathe by particular organs placed along the sides, or at the end, of the body. The larvæ are without wings, and they possess a very com-

plicated arrangement of the parts forming the under lip which covers the face like a mask, concealing the mouth, and serving by the unfolding of its plates for seizing and conveying food. They crawl stealthily along on the bed of the stream like a cat, and when within reach of their victim, spring their mask like a trap upon it with great precision.

These insects remain many months in the water, and change their skins several times. Before undergoing their final transformation, they leave the water by creeping up the stalks of plants, or upon stones or earth. When ready to assume their last and most elegant form, the brilliant eyes of the future fly may be seen through the transparent covering that wraps the insect within its now despised folds. Crawling out upon the bank, or upon some aquatic plant, the pupa skin becomes dry and crisp, and bursts open along the back. The head and eyes of the insect are slowly thrust and drawn out, the wings gradually expand themselves and become smooth, and the fly at last appears in all its beauty, — a gay and splendid creature.

The reader can not fail to notice with astonishment such remarkable changes in insect life. But in this last transformation of the dragon fly, when it bursts forth with a new life and a beautiful body, are we not reminded of the changes that await our own bodies, even of that time when "this corruptible shall put on incorruption, and this mortal put on immortality"?

"And shalt thou, numbered with the dead,
No other state of being know?
And shall no future morrow shed
On thee a beam of brighter glow?"

"Is this the bound of power Divine,
To animate an insect frame?
Or shall not He who molded thine,
Wake at His will the vital flame?"

"Go, mortal, in thy reptile state,
Enough to know to thee is given;
Go, and the joyful truth relate,
Frail child of earth! high heir of Heaven!"

"Marvel not at this," says the Saviour, "for the hour is coming in the which all that are in the graves shall hear his voice, and shall come forth: they that have done good, unto the resur-

rection of life, and they that have done evil, unto the resurrection of damnation."

"No doctrine," says an eminent divine, of the resurrection, "is so sublime, so delightful, or so fitted to furnish consolation and hope to beings whose life in this world is a moment, and whose end is the grave. To this dark and desolate habitation, man, by the twilight of Nature, looks forward in despair as his final home. All who have gone before him have pointed their feet to its silent chambers; and not one of them returned to announce that an opening has been discovered from their dreary residence to some other, more lightsome, and more desirable region. His own feet daily tread the same melancholy path. As he draws nigh, he surveys its prison walls, and sees them unassailable by force, and insurmountable by skill. No lamp illumines the midnight within. No crevice opens to the eye a glimpse of the regions which lie beyond. In absolute despair he calls upon Philosophy to cheer his drooping mind, but he calls in vain. She has no consolations for herself, and can therefore administer none to him. 'Here,' she coldly and sul-

lenly cries, 'is the end of man. From nothing he sprang; — to nothing he returns. All that remains of him is the dust, which here mingles with his native earth.'

"At this sullen moment of despair Revelation approaches, and with a command at once awful and delightful, exclaims 'Lazarus, come forth!' In a moment the earth heaves, the tomb discloses, and a form, bright as the sun and arrayed in immortality, rises from the earth, and stretching its wings towards heaven loses itself from the astonished sight!" — DWIGHT.

CHAPTER III.

The Hessian Fly. — Origin of its Name. — Its Birth and Growth. — The Breeze-Fly. — Its Manner of laying its Eggs. — Its Transformations. — The Gad Fly. — Its Beauty. — Its Effect upon Cattle. — The Zimb. — A Terror to Man and Beast. — The Foe of the Sheep. — Gnats and Musquitos. — Their Unpopularity. — Gnat Dancers. — Early Life of the Gnat. — Its Egg Boat. — Insects in cold Climates. — In the Crimea. — At the South. — Musquitos and their Eggs. — Bryant's Lines to a Musquito. — Du Chaillu. — The Ibolai. — The Iboco. — The Eloway. — The Tzetze. — The Insect Fly-Carrier. — Plague of Flies in Egypt, and Lessons to be derived from it. — God's Care for his Children, and his Anger toward his Enemies. — Prayer and its Results.

IN this chapter we will notice some of the flies which in various ways are injurious to man. Many insects, as is well known, invade our fields. Wheat, and other kinds of grain, are exposed to their ravages, from the time when the green blade shoots forth from the earth, until, having been cut down by the sickle of the reaper, it is carefully stored away in the barn. The farmer often suf-

fers greatly from these troublesome visitors, who are as remarkable for their numbers as for their voracity.

THE HESSIAN FLY.

Perhaps no insect in this country is more noted for its depredations than the Hessian fly. Its name originated in a supposition that it was first brought here in some straw by the Hessian troops under the command of Sir William Howe, in the war of the Revolution. This idea is thought by many to be erroneous, but thus far no trace of its existence in this country has been discovered prior to 1776, when it was found on Staten Island, in the immediate vicinity of Howe's debarkation. Other historical items seem to add plausibility to this supposition. Whatever may be its origin, however, this destructive insect has spread from Staten Island throughout the country. Nothing intercepts it in its course, not even lofty mountains and broad rivers. "Onward, straight onward," seems to be its motto. At one time in wheat-harvest, these flies were seen to cross the Delaware River like a cloud, and so great was the

number, that the houses swarmed with them, to the great annoyance of the inhabitants. They filled every plate and vessel that was in use, and five hundred were counted in a single glass tumbler, that was exposed to them for a few minutes.

Two broods, or generations, are brought to maturity in the course of a year, and the flies appear in the spring and autumn. The transformations of some in each brood appear to be retarded beyond the usual time, as is often the case with other insects; so that the lives of these individuals, from the eggs to the winged state, extend to a year or more in length, and thus the continuation of the species in after-years is made more certain. It is said by some writers that they lay their eggs on the grain in the ear, and it is also well known that they deposit eggs on the young plants long before the grain is ripe. The maggots hatched from these eggs pass down the stems of the grain nearly to the roots, there become stationary, and in June and July take the shape of a flax-seed. They are found in this state at harvest-time, and when the grain is gathered they remain with the stubble in the field. Some, however, do not pass

so far down as to be below the stroke of the sickle, and consequently are gathered and carried away with the straw.

THE BREEZE-FLY, OR BOT.

This insect selects the horse for its victim, and small as it is, is often supposed to cause the death of the noble animal. Contrary to the common opinion, however, some writers insist that it inflicts no pain and does no injury; but it seems scarcely reasonable that the parasite can thus live upon the stomach of the horse without causing disease and suffering, if not even death.

In approaching the animal for the purpose of depositing her eggs, the bot carries her body nearly upright in the air. Suspending herself for a few seconds before the part of the horse she intends to attack, she suddenly darts upon it, and leaves the egg adhering to the hair by means of a glutinous liquid with which it is covered. Retiring then a short distance, she prepares a second egg, which she soon deposits in a similar manner. These movements are repeated until sometimes four or five hundred eggs are placed on one animal.

In this process, the fly selects the parts most likely to be licked by the tongue. After four or five days, the eggs remaining on the hair become mature, and the slightest warmth or moisture is then sufficient to call forth the caterpillar. If, therefore, the egg is touched by the lips or tongue of the horse, the caterpillar is freed, and readily adhering to the surface of the tongue, is conveyed with the food into the stomach. It is probable that the greater proportion of these eggs are taken up in this way, the irritation produced by them causing the horse to make continual efforts to relieve the pain by licking the spots with his tongue.

The caterpillars usually hang in thick clusters from the lining membrane of the stomach. They retain their hold by means of two dark-brown hooks, between which is the mouth of the insect. When they reach maturity, the caterpillars quit the stomach, and are carried off with the food. They then seek shelter in the ground, and burying themselves there become chrysalides. After remaining in this state for a few weeks, they burst from their confinement and delight themselves in

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the air, and in their turn seek the horse for their victim.

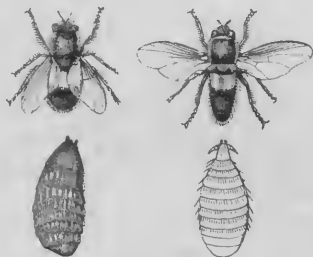
THE GAD-FLY.

This insect is the terror of cattle. A poet in describing the herdsman, aptly says, —

“Light fly his slumbers, — if perchance a flight
Of angry gad-flies fasten on his herd,
That startling, scatter from the shallow brook,
In search of lavish stream. Tossing the foam,
They scorn the keeper’s voice, and scour the plain,
Through all the bright serenity of noon.”

This fly is a beautiful insect, but it inflicts great pain upon cattle in depositing its eggs. Whenever an animal is attacked, the assault is easily known by the extreme terror and agitation of the whole herd. The unfortunate creature runs bellowing from among them, while, from the severity of the pain, the tail is held with a tremulous motion straight from the body in the direction of the spine, and the head and neck are also stretched out to the utmost. The rest of the cattle, impelled by fear, generally rush to the nearest water, or become scattered about the field.

A single fly has been seen to meet a herd when almost driven home, and turn them back,



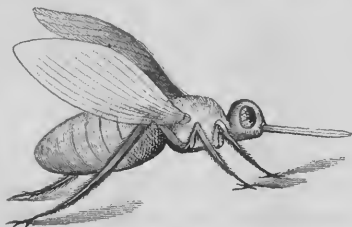
Male and Female Gad-Fly, Caterpillar, and Chrysalis.

the stones, sticks, or shouts of the drivers being of no avail, nor could they be stopped until they had reached their usual retreat in the water. When oxen are yoked to the plow, such attacks from the gad-fly are dangerous, as the animals are beyond all control, and will run in any direction in which their frenzy drives them.

THE ZIMB.

A more terrible insect, still, is the zimb, a native of Abyssinia. Small as it is, the lion and the tiger, and even the largest living creatures, tremble before it.

As soon as the buzzing of these insects is heard, the cattle forsake their food, and run



The Zimb.

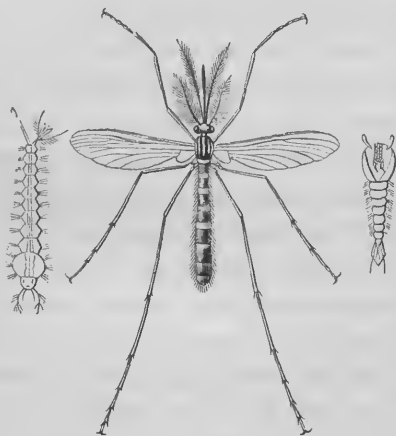
wildly about the plain till they die, worn out with hunger, fatigue, and fright. The camel, the elephant, and the rhinoceros — although the last two coat themselves with mud — are attacked by the zimb, and afflicted with many tumors. The inhabitants of the sea-coast are obliged, in the beginning of the rainy season, to remove to the nearest sand, to prevent their stock of cattle from being destroyed. According to Bruce, the inhabitants of all the countries from the mountains of Abyssinia northward, to the confluence of the Nile and Astaboras, are, once a year, obliged to change their abode, and seek protection in the sands of Beja. Nor are there any means of

avoiding this, though there were in the way a hostile band, capable of spoiling them of half their substance.

While speaking of these tormentors of animals, we will allude to the foe of the sheep. This fly is thought to deposit its eggs on the inner margin of the nostril. The moment this part of the animal is touched the effect is apparent. The sheep shakes its head, and strikes the ground violently with its fore feet; at the same time holding its nose close to the earth, it runs away, looking about on every side to see if the fly continues its pursuit. It also smells the grass as it runs, apparently to ascertain whether one is lying in wait. If a fly is thus discovered, the sheep gallops back, or takes some other direction. As it cannot take refuge, like the horse, or like cattle, in water, it repairs to some dry, dusty place, or to some gravel pit. In such localities, sheep may often be seen crowded together during the heat of the day, with their noses held close to the ground. This position renders it difficult for the fly to enter the nostrils, and is the chief protection of the sheep.

GNATS AND MUSQUITOS.

Of all the insect tormentors, none are so loudly and universally complained of as the gnat tribe, to which many parts of the world are greatly exposed.



The Gnat, Caterpillar, and Chrysalis.

Gnats are lively insects, and have often been held up as examples of cheerfulness and buoyancy of disposition. They are famous for dancing, and that with mathematical exactness; for

no three of them can so place themselves that lines joining their points of position shall form either more or less than two right angles.

The Gnat commences his life on the water. It has been said that man

“Learned of the little nautilus to sail,
Spread the thin oar, and catch the rising gale;”

but he might also have taken a first lesson in boat-building from an object common in almost any pond, — nothing less than a boat of eggs, not a boat loaded with eggs. In fact, the gnat constructs a buoyant life-boat of her own eggs, sometimes using two or three hundred at a time. This singular craft floats safely through all the agitations of the water. In a few days, each of the numerous lives within having assumed the shape of a grub, issues from the lower end of its own flask-shaped egg. The empty shells remain attached together until the winds and waves make a wreck of the tiny vessel. The insect then passes through different transformations, — each as remarkable as its infancy, — until it flies away, a lively, dancing gnat. It is well to observe that

the gnat-biters are females, and their presence is generally told by an unmistakable hum.

Let us travel northward. One would naturally suppose that the cold climate of Lapland would destroy insect life; but not so. There we find a fly the terror of the reindeer, which obliges the herdsman to take long and toilsome migrations with his cattle from the interior to the coast, and from the coast to the interior, at stated periods. To remain in the woods during the summer months would subject the Laplander to the total loss of his deer,—his wealth and dependence. The wild herds migrate instinctively.

But this fly is not the only pest of that climate. We find there countless myriads of musquitos, whose numbers are so prodigious as to be often compared to a squall of snow when the flakes fall fastest. A writer says: "The natives can not take a mouthful of food, or lie down to sleep in their cabins, unless they be fumigated almost to suffocation. In the air you can not draw your breath without having your mouth and your nostrils filled with them; and unguents of tar, or nets steeped in fetid birch oil, are scarcely suffi-

cient to protect the case-hardened cuticle of the Laplander from their bite."

In the Crimea, Dr. Clarke states that the soldiers were often obliged to sleep in sacks, as a defense against gnats; and that in spite of every precaution, many died in consequence of mortification produced by their bites. His own hands, and those of his companions, — notwithstanding the protection of gloves, — were one entire wound, causing great swelling and fever. He says that the noise made by these insects in flying can not be conceived of by those who have heard gnats only in England.

If we pass to the southward we find gnats in abundance. All through the tropical climates the inhabitants suffer greatly from these winged tormentors. Humboldt says, — "Between the little harbor of Hignevote and the mouth of the Rio Unare the wretched inhabitants are accustomed to stretch themselves on the ground, and pass the night buried in the sand three or four inches deep, leaving out the head, which they cover with a handkerchief."

In the Southern States musquitos are found

in great numbers and of large size, and nets or "bars," are indispensable for comfort. At the North, in damp localities especially, as on the shores of ponds and sluggish streams, they are numerous during the warm months, and quite troublesome, but not to any serious extent.

Like other conquerors, mosquitos have given their name to territories; as for example Musquito Creek, in Georgia; Mosquitos, a town in Cuba; and Musquito Territory, in Central America.

It is supposed that the eggs of the mosquito, like those of other gnats, are deposited on the surface of the water, and by means of its moisture, and the warmth of the sun, are matured. The food of the caterpillar is unknown. When it has reached its full growth, it spins a little silken sheath which is attached to the plant which the insect frequents. In this sheath the caterpillar becomes a chrysalis in an upright position, the case being always open at the top. At length the little creature bursts its covering, and the perfect insect emerges through the opening, surrounded by a bubble of air. Slowly it

begins to unfold its wings under the water, and when its skin is cast, and its maturity is reached, it escapes from its former dwelling and mounts to the top of the water. Here the bubble bursts, and the insect appears with new powers and in a new element.

With the music of the musquito, and with its bite, we are sufficiently familiar, and need not speak of them particularly. Bryant, in a lively poem, describes the manner in which this insect is regarded. He says, —

“Fair insect, that with thread-like legs spread out,
And blood-extracting bill and filmy wing
Dost murmur, as thou slowly sail’st about,
In pitiless ears full many a plaintive thing,
And tell how little our large veins should bleed
Would we but yield them to thy bitter need;

“Unwillingly, I own, and what is worse,
Full angrily men hearken to thy plaint;
Thou gettest many a brush and many a curse
For saying thou art gaunt and starved and faint.
E’en the old beggar, while he asks for food,
Would kill thee, helpless stranger, if he could.”

Du Chaillu, the celebrated traveler in equatorial Africa, speaks of several species of trouble-

some flies. One is a small almost impereceptible gnat, which appears in great numbers in the morning until ten o'clock, from which time it is not seen until four o'clock in the afternoon, when its operations recommence and continue until sunset. These little flies are most determined blood-suckers, and very sly in all their movements.

Another species is called the *ibolai*,—an insect twice as large as our common house-fly. It approaches with a sharp whistle, and its sting is long and strong enough to pierce the thickest clothes one can wear in the heat of an African summer.

The *iboco*, another fly, is of the size of a hornet, and very quiet in its motions. Its bite is more severe than that of other African flies, and clothing is no protection against it. Du Chaillu says, "Often the blood has run down my face or arm from one of their savage attacks, and even the well-tanned skin of the negroes is punctured till it bleeds, so that one would think a leech had been at his work on them."

But this traveler speaks most particularly of the *eloway*, a nest-building fly which frequents the water-side, where its hives are hung to the

pendent branches of the trees. It is a monster of ferocity, and the natives run from it as from no other insect of the woods. It is a little fly shaped very much like a bee, but somewhat smaller. The hives or nests are made of clay, and evidently have separate apartments, as the whole pendent bottle-shaped mass is filled with holes, each of which has a little roof over it. When disturbed these flies are very savage, and their bite is exceedingly painful.

TSETSE.

Dr. Livingston, Burton, and other African travelers, speak of the *tsetse* as a very troublesome fly, which by some of the natives is called "the little sword," and by others "the elephant fly," from the fact that it is so often found in company with that animal. It is not much larger than the common house-fly, and in color resembles the honey bee. It is remarkably quick in its motions, and most dexterously avoids all efforts to capture it with the hand at common temperatures; in the cool of the mornings and evenings it is less active. It

has a very peculiar buzz, which, if once heard, can never be forgotten.



The Tsetse Fly magnified.

A remarkable characteristic of the bite of the tsetse is its perfect harmlessness to man and wild animals, and its certain death to domestic animals, — as the ox, horse, or dog. Some portions of South Africa are so infested by this insect, that the inhabitants are unable to rear cattle, the bite of a single fly being sometimes sufficient to cause the death of the victim. Dr. Livingston says, that neither he nor any of his traveling companions suffered the slightest injury from its bite, although they passed months

in the regions where it most abounds. Some localities formerly swarming with the tsetse are now entirely free from the terrible scourge, — probably from the fact that it has been starved out of the country by the absence of its favorite animal food. This fly has boundary lines beyond which it does not pass. One traveler mentions, among other instances, that the south bank of the river Chole was infested with the tsetse, while the opposite bank, not fifty yards distant, and where, too, the cattle were kept, was perfectly free. In other places it has been found on both sides of a stream.

But God's law of compensation is everywhere manifest. Were the tsetse left free to increase without restraint, the land would in many parts be uninhabitable; so the fly has its destroying enemy. There is a long-legged, gaunt-looking insect about an inch in length, which has all the ferocity of a tiger, and springs upon the tsetse and other flies, sucks out their blood, and throwing their bodies aside, seeks fresh victims.

We can not close this subject properly without speaking of

THE INSECT FLY-CARRIER.

Its history is very remarkable. The process it undergoes was described several years ago by a naturalist, as the result of his own observations in the island of Saint Domingo.

According to this authority, this insect, like the silk-worm, is produced from eggs deposited by a butterfly of a whitish, or light-pearl color. It is hatched toward the latter end of July; and so rapid is its growth, that in September the caterpillar is changed into a butterfly. When it first comes forth, it is arrayed in the most brilliant and variegated colors. It feeds on the leaves of the indigo and cassada plants, and as it continues its ravages day and night, the planters consider it a great evil.

In the month of August the caterpillar undergoes one of its changes. Putting off the beautiful hues in which it first appeared, it reflects all the shades of one color, — a sea-green, according to the lights in which it is beheld. It is now attacked by a very small fly, and in such swarms, that it is said there is not a spot on its back or

sides that is not covered by them. These insects immediately deposit their eggs on the body of the caterpillar, which appears for a short time afterward in a state of lethargy, and then awakes to feed with renewed activity.

In about fourteen days, during which time the caterpillar increases in size ; it is completely covered with a garment of living creatures of a deep brown color, only the top of the head however, being visible. Upon more minute examination, it is found that each one of these little creatures, raising itself on its hinder-part, swings its body to and fro in every direction, and forms for itself an extremely small egg-shaped cocoon, remaining, like the silk-worm, within the ball.

The millions upon millions of cocoons thus singularly produced, and that in about the space of two hours, are placed so closely together, that they form a white robe, in which the creature appears elegantly clothed.

While this decoration proceeds, the caterpillar appears in a torpid state ; but no sooner is the robe completed, than the wearer seeks to free itself, and succeeds in the effort. Its appetite is

now gone. It speedily passes into the state of a chrysalis, then becomes a butterfly, and after producing many hundred eggs, dies. When about eight days have elapsed from the first formation of the small cocoons already described, flies issue from them, leaving the fibrous substance pure, beautifully fine, and of a dazzling whiteness. It is said that this may be carded and spun without any preparation.

The reader will remember it was by a plague of flies that Jehovah laid waste the land of Egypt, and humbled Pharaoh's haughty spirit. David refers to this in one of his psalms: "He sent divers sorts of flies among them which devoured them." Turn to the eighth chapter of Exodus, and read the account so vividly given. The Lord spoke to the monarch of Egypt, saying, "Thus saith the Lord, let my people go, that they may serve me. Else, if thou wilt not let my people go, behold, I will send swarms of flies upon thee, and upon thy servants, and upon thy people, and into thy houses; and the houses of the Egyptians shall be full of swarms of flies, and also the ground whereon they are."

In connection with this threat, is this remarkable declaration : “ And I will sever in that day the land of Goshen, *in which my people dwell*, that no swarms of flies shall be there ; to the end thou mayest know that I am the Lord in the midst of the earth. And I will put a division between my people and thy people : to-morrow shall this sign be. And the Lord did so.”

The land of Goshen, where the Israelites dwelt, was pasturage ground, and was not cultivated, because it was not overflowed by the Nile. But the land regularly inundated by this remarkable river was the rich black earth of the valley of Egypt, and it was to this that God limited the flies.

Thus it appears that Jehovah, the God of the whole earth, graciously and miraculously protected the region inhabited by his own chosen people, while he executed judgment on his enemies who dwelt at their side, and that, too, by means of flies which pass so easily from place to place : “ There came a grievous swarm of flies into the house of Pharaoh and into his servants’ houses, and into all the land of Egypt ; the land was corrupted by reason of the swarm of flies.”

God will always protect his children, and although "slow unto anger," will as surely punish his enemies. The Psalmist had reason to say, "Truly, God is good to Israel;" and we can say, as we look upon the plague of flies, "Behold, therefore, the goodness and severity of God; on them which fell, severity; but toward thee, goodness, if thou continue in his goodness."

Remember, too, how Moses entreated the Lord that the flies might depart: "And the Lord did according to the word of Moses; and he removed the swarms of flies from Pharaoh, from his servants, and from his people; there remained not one." How true it is that "the effectual, fervent prayer of the righteous man availeth much." Prayer is our strength and our safety in every circumstance of life. Our security from evil is well expressed in the words of the Christian poet, Montgomery:—

"Call Jehovah thy salvation,
Rest beneath the Almighty's shade;
In his secret habitation
Dwell, nor ever be dismayed:
There no tumult can alarm thee;
Thou shalt dread no hidden snare;

Guile nor violence can harm thee,
In eternal safeguard there.

“Only with thine eye, the anguish
Of the wicked thou shalt see,
When by slow disease they languish,
When they perish suddenly:
Thee, though winds and waves be swelling,
God, thine hope, shall bear through all;
Plague shall not come nigh thy dwelling,
Thee no evil shall befall.

“He shall charge his angel legions
Watch and ward o'er thee to keep,
Though thou walk through hostile regions,
Though in desert wilds thou sleep:
On the lion, vainly roaring,
On his young, thy foot shall tread;
And the dragon's den exploring,
Thou shalt bruise the serpent's head.

“Since with pure and firm affection
Thou on God hast set thy love,
With the wings of his protection
He will shield thee from above:
Thou shalt call on him in trouble,
He will hearken, he will save;
Here for grief reward thee double,
Crown with life beyond the grave.”

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THE GALL INSECT.

“Neither is there any creature that is not manifest in His sight.”

THE GALL INSECT.

CHAPTER I.

Auger of the Gall Insect. — Depositing of an Egg. — The young Insect. — Galls. — Where found. — Their Nature. — Varieties of Form. — Oak-Galls. — Apples of Sodom. — Galls used for Ink. — Value of Ink. — Care over Mouth and Pen. — Use of the Pen for Good or Evil. — Religion a governing Principle in Life.

WHEN looking, for the first time, upon any production of human art, there is no security against disappointment; for man, at best, is but a finite creature, and imperfection must, of necessity, accompany all his works. But it is not so in the kingdoms of Creation and Providence. Here everything bears the impress of a divine original, and each object, the more it is studied, the more clearly displays the wisdom and skill of its Maker.

The gall insects illustrate this general fact. Although little known, yet when they receive due attention, they bring before us a most singular provision for inferior creatures, the peculiar and admirable means by which it is secured, and its subserviency in various ways to the good of mankind.

The first question that naturally arises is, — What are galls?

Certain insects, called gall insects, deposit eggs beneath the outer covering of plants, sometimes on the roots, sometimes on the branches, or upon the leaves and buds. The juices of the vegetable expand, and form excrescences around the eggs, varying greatly in size, shape, and character. These are galls.

Having given this general answer, let us examine more particularly into the origin and structure of these curious substances.

Each gall insect is provided with an auger, nicely adapted in form to the body, and to the work to be performed. It is hollow, and the end is set with small teeth, like the iron point of an arrow. With this curious instrument the insect

makes openings in chosen parts of a tree or plant, and in these deposits its eggs. Around these eggs substances are formed, in which the young insects live and find their means of support. Upon emerging from the egg, the little caterpillar sucks and gnaws the interior of the gall, which becomes hard, and increases in size in proportion as the creature eats.

It is well to observe here that there are false galls, which are equally common with those just described. These are found on a great variety of plants, and often are very remarkable both for size and abundance. They are seen, however, on fewer parts of the plant or tree than the true galls, being almost wholly confined to the leaves and the flowers, or the neighboring and delicate parts. Hollow reddish protuberances may be observed growing in abundance on the branches of the elm, and sometimes entirely covering them. These are the production of a different class of insects, and, when young, are inhabited only by a single female. In the middle of the summer, however, hundreds of insects here find their home. Sometimes the galls are entirely closed, and at

other times there is a communication with the exterior.

There is great diversity among the gall insects, properly so called ; but in one respect there is an unvarying likeness. All of them lay eggs under the outer covering of plants, and within the substances formed over their eggs the insect dwells, and from it derives its support.

Galls may be found on every part of a plant, sometimes not larger than the head of a pin, and often of considerable size. Some are juicy, and others extremely hard. This difference in char-



Galls on a leaf.

acter seems to be dependent upon the pleasure of the insect. On a single leaf the same insect

will produce one gall of the former, and another of the latter kind.

Many galls have one cavity shutting up a number of caterpillars living in society. Others have several small cells opening into each other. In some cases, more than a hundred have been observed, each containing a single caterpillar. Other species of galls have but a single cavity, and that is inhabited by a lonely insect.

The majority of galls increase in size very rapidly. Those of the largest species attain their full growth in a few days, and even, as it often appears, before the caterpillar issues from the egg; so that when it does come forth, it finds its lodging already prepared. These little creatures grow very rapidly, but they remain in the gall five or six months. Some pass into the chrysalis state in the gall, from which they escape in the perfect form after making a small hole in it. Others quit the gall to enter the earth until they have reached the perfect state.

A very simple and common form of these nests for the young insects may be observed on the leaves of various trees during the summer

months. A berry-like substance, of a green color, tinged with red, may be seen on the willow, the poplar, and the rose-bush. Let one of these be cut open, and it will be found the dwelling of an egg or a caterpillar.

Nor is winter without a similar provision for inferior creatures. There is, for example, an insect which feeds on the sweet violet, and is defended in a remarkable manner by a gall from cold, and all external enemies and injuries.



Galls on the leaf-stalk of the Violet.

Sometimes in the summer or autumn, the par-

ent insect lays its eggs on or in the growing shoot of the violet. When these are hatched, the caterpillars cut their way into the soft parts of the plant, which, thus having its juices interrupted, bulges out around the little creatures, which thus find an abode. Here they live during the coldest of weather, and with an abundance



Currant Galls.

of food, and when the summer comes they issue forth as perfect insects. There are, also, winter

retreats for caterpillars in many other plants, arranged in various ways.

Galls present great varieties of form. The most common ones are rounded. Many have received from their color the names of certain fruit which they resemble. Thus, some specimens found on the oak, are called apple, gooseberry, or pippin galls. Many galls also resemble fruit in their spongy or porous nature. Among those of a round form, some are fixed directly upon the plant, while others are attached by a short stem. The currant galls are represented in the preceding engraving.

Many galls appear to be a portion of the plant, swollen and thickened; such are those seen on the willow and osier. Various vegetables, and their different parts, exhibit these curious substances differently figured upon the surface.

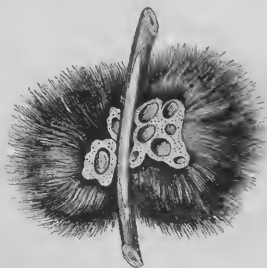
There is a species of fibrous gall which is very remarkable. It is as large as an apple, and is covered with long reddish threads. It appears on the eglantine, or wild rose, which sometimes bears three or four of them.

This engraving represents the exterior of the



Gall of the Wild Rose

gall of the wild rose ; while the following one shows the interior, with the caterpillars and the perfect insect.



Interior of the Gall on the Eglantine ; three representations of the caterpillar, and the perfect insect with its auger.

The same shrub presents a still rarer species which grows at the ends of the branches, where

it forms a mass composed of a dozen little galls of various forms.

We will not stop to describe the gall of the ground-ivy, the sage gall, or that of the birch, but will pass on to the gall of the field-cirsium. This is merely an enlargement of the stem of that plant, and was formerly in high repute, because when carried in the pocket it was considered a sovereign remedy against bleeding.



Oak Apples.

This virtue it was said to owe to its likeness to a swollen vein ! Superstitions like these are

fast disappearing before the light of religion and science.

The oak has the greatest number of galls. Some have the form of little apples, detached or united; others are prickly; some are branched, and others resemble little artichokes or mushrooms. Many times some of the leaves are laden with small rough galls which appear like buds, while other leaves of the same tree have galls which are similar in form to an open goblet. These are flattened even, or crisp, and the substance is woody or spongy, according to the locality in which the egg was deposited.

APPLES OF SODOM.

Perhaps the reader has met with some account of the far-famed apples, growing

“Near that bituminous lake where Sodom stood.”

Tacitus and Josephus mention these “apples of Sodom,” and describe them as beautiful to the eye, but crumbling, when touched, to dust and bitter ashes. Many later writers consider their statement unfounded, while others, admitting the fact,

have endeavored to account for it in various ways. One author supposes the apple referred to, to be the pomegranate. This has a hard tough rind, and when left upon the tree two or three years, the inside becomes dried to dust, while the outside remains fair. Another writer thinks these apples to be the fruit of a species of cotton-tree ; while a third tells us that the shrub which bears it grows two or three leagues from the mouth of the Jordan. He says it is thorny, with small tapering leaves, and that its fruit is similar to the little Egyptian lemon, both in size and color. Before it is ripe, it is filled with a corrosive and saline juice. When dried, it yields a blackish seed which may be compared to ashes, and which in taste resembles pepper.

Still another traveler found in a thicket, about half a mile from the plain of Jericho, a shrub five or six feet high, on which grew clusters of fruit about the size of a small apricot, of a bright yellow color, which contrasting with the delicate verdure of the foliage, seemed, to use his own words, "like the union of gold with emeralds."

The marvelous fruit, which has led to so much

discussion, appears at last, however, to be the work of one of the gall insects. Some specimens have lately been brought home by a traveler in the Holy Land. The tree which produces these galls grows in abundance on the mountains in the neighborhood of the Dead Sea, and is about the size of our common apple-trees. The fruit is of a rich purple color, and varnished with a soft substance of the consistency of honey, and it shines with a brilliant luster in the sun, and has a very delicious and inviting appearance.



Apple of Sodom.

The accompanying engraving represents one of these apples.

This traveler tasted the fruit, and found it in

reality "as bitter as gall." It is pear-shaped, with a circle of small sharp-pointed protuberances on its upper part. In each gall there is an opening through which the insect escapes from a small round hole in the center, where it has lodged.

Many galls are merely objects of curiosity. But there is one of great value, well known in



Oak Galls of Commerce.

commerce, and which abounds in Asia Minor, Syria, and Persia. It has no smell, but a bit-

ter and astringent taste, and is much used in the manufacture of ink. It is nearly round, and varies from the size of a pea to that of a hazel-nut. When good, it is of a black or deep olive color.

Galls of this species are heavy, and break with a flinty fracture. They are known in commerce as white, blue, and green galls. The white are those which have not been gathered until the insect has made its escape. They are lighter than the others, and do not command so high a price. The blue and green galls are gathered while the insect is still shut up within its little home. These are much heavier than the white, and are said to yield about one third more useful coloring matter.

How many of the readers of this book have ever thought of their great indebtedness to these galls? Every child knows the use of ink, but how many know that we are dependent, in a great measure, upon insects for this indispensable fluid? How have the little creatures enabled us to converse with our absent friends, however distant they may be from us! How they have contributed to our wisdom, our happiness,

our temporal and even eternal welfare, by speaking to us from the printed page! The human voice can be heard but a short distance, but the pen sends forth "winged words" to the ends of the earth. It has been justly said that "the pen is mightier than the sword;" and especially is this true at the present day, when the world is governed more by great principles than by physical force. How important it is, then, that our pens should convey nothing that can scatter the seeds of vice or immorality, but that everything emanating from us, whether it be in the spoken word, or the written page, should be sanctified to the service and glory of God! Paul says, "Let no corrupt communication proceed out of your mouth, but that which is good to the use of edifying, that it may minister grace unto the hearers." If we apply this same precept to the work of our pens, we may prove a blessing to the world, and God will be honored and glorified in our lives.

Several years ago, a poet gave to the world some pleasing thoughts concerning ink. He had been solicited to write an essay for a lady's port-

folio. After describing the first page of his paper "as white and smooth, and empty as air," he says, "I turned to the inkstand, and looked into it, like *Æsop's* thirsty crow into the pitcher with a drop of water at the bottom, which the sagacious bird raised to the brim by dropping pebble after pebble into it. But my difficulty was not to bring the ink out of the stand, but the meaning out of the ink. Ah! quoth I, gently shaking it, here lies the quintessence of all science, all art, all invention, all expression. This drop of ink could speak all languages, display all knowledge, detect all sophistry. There is not a thought which the heart of man can conceive, or a word which the lips can utter, but it is here, absolutely in my hand, before my eyes; yet I am so blind, or so stupid, that I can discern nothing but a decoction of nut-galls and copperas. Oh that I had a chemical test, whereby I might analyze this little fluid, and learn, not what it is made of, but what might be made of it!

"I am too dull, at present, to fish up a single idea from the bottom. Yet if ten thousand people were to sit down to the experiment, each one

would produce something different from every other; and were they all to record their thoughts in this ink, with this pen, on this paper, their themes, their thoughts, their diction, would appear as diverse as their faces, their voices, and their handwriting."

The pen may be used for good or evil. Cowper says,—

"The sacred implement I now employ,
Might prove a mischief, or, at best, a toy;
A trifle, if it were but to amuse;
But, if to wrong the judgment and abuse,
Worse than a poniard in the basest hand,
It stabs at once the morals of the land."

How great is the responsibility of those who furnish reading matter for the young! And how delightful is the task of implanting in the minds of thousands of readers, germs of thought and action, which in after-years shall bring forth glorious fruit!

To communicate valuable knowledge, especially that which is calculated to lead the heart, under a sense of sin, to the only Saviour, is indeed to use the pen aright. For such a service great

genius is not required ; — persons of humble powers may in this way be useful.

An old writer has said, — “ The letter from a Christian friend which has nothing about Christ in it, is not worth the postage, although it stated that he who received it was entitled to a valuable estate.”

Let it be the concern of every reader, first to obtain, in the exercise of faith, a personal interest in that Saviour, who died the just for the unjust, and then, by all the means that can be employed, using, of course, judgment and discretion, urge others to seek and find him. A sentence, a few words, even a single word, often has been rendered effectual, by the Holy Spirit, to a sinner's salvation.

“ A word fitly spoken is like apples of gold in pictures of silver.”

CHAPTER II.

Love of Colors. — Ornament. — Superstitious Practice. — Joseph's Coat. — Purple. — The Kermes. — Gathering of Kermes. — The Cochineal. — Accidental Discovery of Scarlet, Gobelin Tapestries. — Lac. — Value of the Insect Tribes. — Gratitude to God.

FROM the earliest times, mankind has shown a great love for colors, and in his dress has imitated the brilliant hues displayed by nature in the plumage of birds, in flowers, crystals, and shells, and in the tints of the morning and evening sky. The love of ornament is common to all. So strong is this feeling, that savage people, when without clothes, have been accustomed, as is well known, to paint their bodies in a variety of colors.

It has sometimes been said that the "coat of many colors" made by Jacob for his son Joseph, proves that dyeing was known at that early period. This is by no means the case. It is probable that this tunic, made for the patriarch's much-loved child, was formed of differently colored

pieces joined together to produce an agreeable effect. In India, it is still a custom to present a favorite or beautiful child with a "coat of many colors," the various portions of which are often very tastefully sewed together. This custom has a superstitious origin; for the people believe that, if a child is clothed with a many-colored coat, he will be injured by neither tongues nor evil spirits.

Although it is not certain that Joseph's coat was dyed, it must be admitted that, as most of the materials suitable to be manufactured into cloths are dull and somber in their colors, any hint would naturally be seized with eagerness to obviate the unpleasant monotony. The effects produced by the juices of plants and fruits, and also by rain upon certain kinds of earth and minerals, might furnish suggestions that would be turned to account.

It is doubtless true that in all countries there are substances of various kinds capable of producing great diversity in the appearance of cloths. Still there must have been, in the early ages, great difficulty in ascertaining how they were to

be used. Many experiments must have been made, and many disappointments experienced, before any success could be obtained.

Frequent reference is made in the sacred and uninspired writings to the color of purple. The preference given to it as a royal color may be accounted for, in part, by its richness, and also by its great value in ancient times. It is associated with the monarchs of by-gone days, and with the services offered by the heathen to their idols. In the book of Exodus, too, it is frequently mentioned in connection with the dress of the high-priest, and the decorations of the tabernacle.

It is important to observe, however, that the word purple, in ancient writings, does not denote one particular color, or shade of color. Pliny mentions the difference apparent in some of the purples. One was faint, approaching to our scarlet, and considered of inferior value; another was a deeper red; and a third was still deeper and richer.

It is stated that when the beautiful purple of Tyre was first discovered, it was appropriated by the sovereign to whom it was presented as a royal

distinction. This seems to have been of the deepest tinge, referred to by Pliny. The Tyrian purple was not, in fact, one particular color, but a class of animal dyes, as distinguished from those which were vegetable, and varying from the faintest to the intensest hue.

No doubt exists as to the means by which these colors were obtained. In addition to the dye produced by a mollusk, called the *murex*, a crimson or scarlet color was in ancient times produced by an insect called *kermes* by the Arabs, *kokkos* by the Greeks, and *thola* by the Phœnicians. It is now known as the *coccus ilicis*. From the name first mentioned, are derived our words *carmine* and *crimson*. The curtains of the Jewish Tabernacle are supposed to have been dyed by means of *kermes*. The brilliant reds of the Flemish tapestries were obtained in the same way. During the Middle Ages, the name *vermiculatum* was applied to the insect producing this color, and thence we derive our word *vermilion*.

THE KERMES.



Male.



Female.

The female of the kermes attains the size and form of a pea. Its color is a violet-black, and its body is covered with a whitish powder. This species is common over the south of Europe, on the evergreen oak, and seems to be widely distributed over many of the south-eastern countries of the ancient world. It abounds in Spain, where it attaches itself chiefly to the twigs and leaves of a small spiny-leaved species of the same tree.

The precise time of the laying of the eggs is not generally known, as the female usually covers them with her body. Some species, however, cover but a portion. The eggs of the latter

are deposited in a mass of silk or cotton threads, whitish in color, and often mistaken for the eggs of spiders. These threads, covering the nest of eggs, are worked into a rounded shape on the upper side. When lightly touched, the mass attaches itself to the fingers, and a great number of threads are removed. The coloring matter is not spun, but escapes from under the shell.

Pigeons are said to be very fond of the kermes, and during the harvest-time it is necessary to watch them carefully. The peasants of certain districts in France, and those of some other countries, collect every year precious crops of kermes. These are more or less abundant according to the mildness or severity of the winter. Should the season pass away without fogs or frosts, the harvest is good. The oldest trees, and those that appear the least vigorous and are the least cultivated, are most heavily laden with kermes. The soil also contributes to their bulk and the brightness of their color. The insects which come from shrubs near the sea are larger and of a more brilliant color than those which are found upon trees more remote.

The harvest of kermes is gathered by women. They remove the insects from the shrubs with their nails, and one woman can gather two pounds in a day. Oftentimes there are two harvests in a year. In the second, the insects are attached to the leaves, but the crop is neither so large nor so valuable as the first.

When gathered, the kermes are wet with vinegar, in order to remove easily the pulp or red powder they contain. They are then washed in wine, and, after being dried in the sun, are polished by rubbing them in a sack, after which they are packed away, mixed with a quantity of their own powder. The price of the kermes depends upon the quantity of powder which they yield. The best powder is that which comes out of the hole which is on the side where the kermes is fixed to the tree. Before the discovery of cochineal, the kermes was the insect universally used for dyeing the most brilliant red then known. But it has now been supplanted in a great degree in Europe, although in India and Persia it is still used.

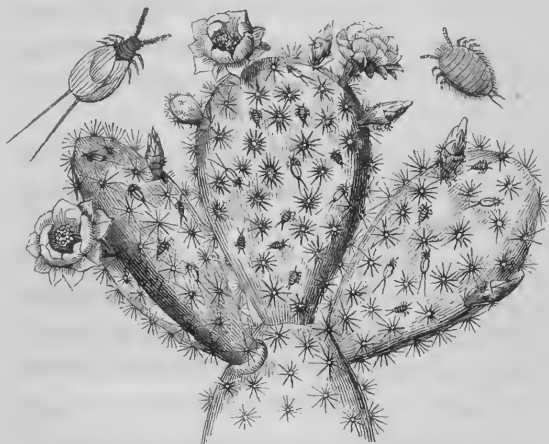
COCHINEAL.

The cochineal insect is a different species from the kermes. While the latter is called the *coccus ilicis*, being found on the *oak*-tree, the former is called the *coccus cacti*, the cactus-plant being its chosen home.

The history of the cochineal insect was for a long time very obscure, and the species employed in commerce was even at one time considered as a kind of grain.

It was only toward the close of the seventeenth century that the insect origin was discovered. These valuable creatures are natives of Mexico, where they were cultivated long before the European conquest of that country. There are several varieties, named from the provinces where they are raised. Of these, the one called *Mastique*, or *Mèsteque*, is considered the best. This insect is reared on a shrub called the *nopal* by the Indians, but known to us as the cactus. The *nopal* is a plant consisting of little stems, and, when in a flourishing state, its buds are furnished with multitudes of little prickles. It expands

into wide, thick leaves, which, being set out at a distance of two or three feet from each other, are inoculated, as it is called, with the cochineal.



The Nopal, on which cochineal insects are feeding. The male, on the left, and the female, on the right, are magnified.

The cochineal insect is so valuable, and ministers so much to the gratification of the eye, that the reader will expect a fuller description than the simple facts just stated.

The females have a small, short, and almost conical beak, placed between the first and second

pair of feet, which contains a sucker, composed of three pieces, and which is inclosed in a four-jointed sheath. Through this tube they draw forth the juices of the leaves and tender stems. They also fasten themselves, from time to time, to some part of the plant, in order to change their skin; and, after arriving at a certain size, they become attached to some chosen spot, where they form a little nest, protected by a tapestry of cotton.

When the insect has attained what is called its perfect state, it is filled with a multitude of very small eggs.

The egg-laying is a curious process. They do not appear externally, but are made to pass beneath the body, and between it and the cotton tapestry. As, however, the insect becomes empty, the lower surface of the body approaches the upper, and leaves beneath the body a kind of arch to receive the eggs. The female never moves from her place, but, having laid her eggs, she dies, and her body, shriveling up and hardening, becomes a covering for the young when they are hatched. As soon as this takes place, the

little insects work their way from the dead body of their parent.

The young of both sexes, on first leaving the egg, are rather active, and run about among the leaves and branches of the cacti. So small, however, are they at that time that they can not be seen without a microscope. They are flat, ovular, and without wings, and have short and indistinct antennæ, or feelers.

The caterpillars of the males are much fewer than those of the other sex, although by no means rare. As they have no sucker like the females, their mode of support is not clearly known; but they increase in size, and, after a time, their skin hardens, and serves as a cocoon. From this they pass into the chrysalis state.

The natives of the districts where these insects are reared, cultivate plantations of the cactus. This plant grows freely from cuttings, which are fit to receive the insects in eighteen months. A few females are placed in a small nest, formed of tufts of a thread-like substance gathered generally from a species of palm. This is done about the middle of October, at which time fine weather

usually succeeds the rains. Nests of this kind are attached to the spines of the plant, on the side facing the rising sun. The eggs are soon laid and hatched. As each female produces upward of a thousand young, a large colony is soon obtained. It is said that six generations are produced in a year. A small number of cochineals is sufficient for each plant, which, as it increases its leaves, is sure to be covered with the insects. When the cactus is well saturated, they are scraped off with great care; but only the female is used in dyeing, as its color is much more beautiful than that of the male.

The insects are first collected about the middle of December, and are removed from the tree by a knife with a blunted edge. As soon as this is done, the nests are taken away, and the dead females picked off. These are lighter and of less value than those which are removed alive, the former losing more than the latter by drying. Each kind may, however, be kept for any length of time without further loss. Those taken off alive are killed by dipping the basket containing them into boiling water, or by placing them in a

hot oven, or on plates of hot iron. The first method secures the best color.

The cochineal arrives in the United States and Europe in the form of a small grain, having a convex and a concave side, and possessing some traces of the segments of the body of an insect.

The tincture of cochineal alone yields a purple color, not very agreeable, but which may be made a most beautiful scarlet by a solution of tin in *aqua regia*. This was discovered by a singular accident. A person having placed in his window an extract of cochineal, made with boiling water for the purpose of filling a thermometer, some *aqua regia* dropped from a vial broken by accident, which stood above it, and changed the purple dye into an elegant dark red. Subsequent experiments showed that the tin deposited in the *aqua regia* caused the change. An ingenious dyer at Leyden brought the discovery to perfection. The secret afterwards became known, and a large dye-house was erected by the celebrated Giles Gobelin, at Paris, and hence the origin of the famous Gobelin tapestry. About the year 1643, a Fleming, named Kep-

ler, established the first dye-house for scarlet in England at the village of Bow, from which fact, scarlet was for some time in that country called Bow-dye.

Another remarkable product of insects of the same species is *lac*. It is collected from various trees in India, where it so abounds, that it could be readily supplied to ten times the amount now used. It is manufactured into beads, rings, and other similar ornaments. Added to lamp- or ivory-black, after being dissolved in water containing a little borax, it makes an ink, which, when dry, is not easily acted upon by dampness or by water. In its native state, adhering to the twigs, it is called *stick-lac*. When separated, pounded, and freed from the greater part of the coloring matter, it is called *seed-lac*. When melted, and made into cakes, *lump-lac*; and when stained, and made into transparent plates, *shell-lac*. It was for a time chiefly employed in varnishes, japanned ware, and sealing-wax, but recently it is very extensively used for dyeing scarlet.

In closing this description of an insect so

little known and yet so well entitled to our attention, we are reminded of an obligation to God for the many ways in which he ministers to our pleasures and our necessities. This insect, apparently so insignificant and unworthy of notice, has contributed more to the arts and sciences than any other. It decorates our clothing and tapestry with pleasing colors; it gives permanent utterance to the emotions of the heart and the workings of the mind. We have thus another illustration of the truth that God has made every thing for some good purpose, and that each creature has its own place to fill in the great plan of creation. We are taught our mutual dependence; that blessings come to us from a thousand unsuspected sources, that unity of design characterizes all created things, and that the chief end of our existence is to glorify God as He is manifest in the kingdoms both of nature and of grace. How humble we should be in the presence of our Maker, when even an insect is necessary for our happiness.

“Pride, the never-failing vice of fools,”
should have no place in the heart of man. All

things teach us humility, by which, with the fear of the Lord, are riches, honor, and life.

“The bird that soars on highest wing,
Builds on the ground her lowly nest;
And she that doth most sweetly sing,
Sings in the shade when all things rest.
The saint that wears heaven’s brightest crown,
In deepest adoration bends;
The weight of glory bows him down,
Then most, when most his soul ascends;
Nearest the Throne itself must be
The footstool of humility.”

THE END.

